A revision of the Old World species of *Scirpophaga* (Lepidoptera: Pyralidae)

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Contents

Synopsis 185
Introduction 185
Material studied 186
Acknowledgements 187
The main characters of Schoenobiinae 188
Taxonomic history of the genus *Scirpophaga* 189
Biology and host-plants 191
Zoogeography of *Scirpophaga* 193
Scirpophaga Treitschke, 1832 195
General morphology of *Scirpophaga* 196
Key to species-groups of *Scirpophaga* 202
The *praelata*-group 203
Key to species of the *praelata*-group 204
The *excerptalis*-group 222
Key to species of the *excerptalis*-group 222
The *occidentella*-group 233
Key to species of the *occidentella*-group 233
The *lineata*-group 240
Key to species of the *lineata*-group 240
The *incertulas*-group 242
Key to species of the *incertulas*-group 243
The *gotoi*-group 249
The *whalleyi*-group 250
References 251
Index 297

Synopsis

The genus *Scirpophaga* is revised. Thirty-five species belonging to seven species-groups are recognized, one genus and twelve species are newly placed in synonymy, *S. excerptalis* is reinstated from synonymy, ten species are transferred to *Scirpophaga*, *S. praelata* var. *xanthopygata* is raised to specific rank, and five species are described as new. One neotype (for *S. virginia*) and nine lectotypes are designated. The main characters of the Schoenobiinae are given and the general morphology of *Scirpophaga* is described; the species are separated mainly on genitalic characters. The zoogeography of the group is briefly discussed and a distribution map of each species is included.

Introduction

The rice and sugar-cane borers of the genus *Scirpophaga* have long been known as species of economic importance. Because of external similarity among the species in this group, the identities of the various species have been very confused. The earlier descriptions are based mainly on external morphology. Except for those of the Australian species, the genitalia have not

previously been studied. When sexual dimorphism occurs, the male and female have usually been described as two distinct species or even put in separate genera.

The need for taxonomic revision of the species of *Scirpophaga* has become great (Jepson, 1954), many entomologists having experienced considerable difficulty in identifying them. The papers on the systematic position of the species in this group by Butani (1970) and Nagaraja (1972), who tried to establish the stability of the name of the sugar-cane top borer in India, have been unsuccessful since they misidentified the species and wrongly synonymized many names.

The present work consitutes a revision of the taxonomy of *Scirpophaga*. Numerous specimens in the British Museum (Natural History) and on loan from many other museums have been examined. The type-specimens of all species have been studied and dissected. One neotype and nine lectotypes are designated in the interests of nomenclatural stability.

Study of the Old World species of *Scirpophaga* revealed that the specimens in the various collections were badly mixed and showed that, because of numerous misidentifications, the literature could often not be relied upon. In this work many of the taxonomic problems have been clarified. It is hoped that this will be useful not only to taxonomists but also to any entomologist dealing with the control of these stem borers.

The measurements given are those of the wing span. They are calculated by measuring with dividers from the middle of the thorax to the apex of the forewing and mulitplying by two. The measurements are given to the nearest 0.5 mm. The length of the labial palpus was measured in proportion to the length of the compound eye. The latter was measured antero-posteriorly and the former from the basal segment between the eyes to the tip of the scales on the terminal segment. When available, ten specimens were used.

The data of the type-material are fully cited. The localities plotted in the distribution maps are those recorded with the material examined. A dot generally indicates one locality, but may represent several localities when they are very close together.

Material studied

Most of the material studied is in the British Museum (Natural History). Various other museums kindly loaned type- and additional-material. The abbreviations used for the museums or institutions where types and other material are deposited are as follows.

ZM, Amsterdam	Zoölogisch Museum, Amsterdam, Netherlands.
DA, Bangkok	Department of Agriculture, Bangkok, Thailand.
MNHU, Berlin	Museum für Naturkunde der Humboldt-Universität, Berlin, East Germany.
MAK, Bonn	Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn, West Germany.
UM, Bremen	Übersee Museum, Bremen, West Germany.
ANIC, Canberra	Australian National Insect Collection, C.S.I.R.O., Canberra, Australia.
ZM, Copenhagen	Zoologisk Museum, Copenhagen, Denmark.
IP, Eberswalde	Institut für Pflanzenschutzforschung, Eberswalde, East Germany.
MHN, Geneva	Muséum d'Histoire Naturelle, Geneva, Switzerland.
LN, Karlsruhe	Landessammlungen für Naturkunde, Karlsruhe, West Germany.
RNH, Leiden	Rijksmuseum van Natuurlijke Historie, Leiden, Netherlands.
BMNH	British Museum (Natural History), London, England.
ZSBS, Munich	Zoologische Sammlung des Bayerischen Staates, Munich, West Germany.
AMNH, New York	American Museum of Natural History, New York, U.S.A.
CNC, Ottawa	Canadian National Collection, Biosystematics Research Institute, Ottawa, Canada.
UM, Oxford	University Museum, Oxford, England.
MNHN, Paris	Muséum National d'Histoire Naturelle, Paris France.
EIHU, Sapporo	Entomological Institute, Hokkaido University, Sapporo, Japan.
NR, Stockholm	Naturhistoriska Riksmuseet, Stockholm, Sweden.
MRAC, Tervuren	Musée Royal de l'Afrique Centrale, Tervuren, Belgium.
NM, Vienna	Naturhistorisches Museum, Vienna, Austria.
NMNH, Washington	National Museum of Natural History, Washington, D.C., U.S.A.

Approximately 5000 specimens of the genus *Scirpophaga* and other related genera have been studied, and about 1000 genital preparations have been made. The study includes, where it has been possible, examination of the type-specimens of all Asian, African and European species originally described in *Scirpophaga, Schoenobius, Apurima, Topeutis* [*sic*], *Helonastes* and *Niphadoses,* or subsequently placed in these genera.

Acknowledgements

This study was carried out in the Department of Zoology and Applied Entomology, Imperial College of Science and Technology, London. I am deeply grateful to Mr H. E. Goto for supervising the course of this study and for his continuous assistance and encouragement throughout, and to Dr R. G. Davies for advice and clarification of some morphological problems. I am greatly indebted to Professor T. R. E. Southwood, former Head of the Department, for the facilities provided at the college.

Most of the material studied is in the collection of the British Museum (Natural History). I wish to express my sincere thanks to the Trustees of the British Museum (Natural History) and to Dr P. Freeman, Keeper of Entomology, for their permission to study the museum material and for the many facilities provided. I am most grateful to the staff of the Lepidoptera Section for their kind help. My special gratitude is expressed to Dr P. E. S. Whalley for his enthusiastic advice and suggestions concerning the field of investigation and research technique, and also for kindly affording much assistance in securing for study type-material from other museums; to Dr I. W. B. Nye for his help in clarifying some taxonomic and nomenclatural problems and also for generously giving some of his time while visiting continental museums to locate and sort certain type-material essential to this study; to Dr K. S. O. Sattler who provided valuable suggestions, criticism and technical remarks; to Mr M. Shaffer for his enthusiastic help in giving advice, in sorting out from the museum collections the material available for study and in preparing plates for publication; to Mr A. Watson who paid much interest and encouragement in this study, to Mr W. H. T. Tams for his valuable information and suggestions, and to Mr W. G. Tremewan for his help and advice on bibliographic and editorial matters. The photographs of the adult insects were taken in the Museum by Mr P. York. Mr B. Martin also took some of the Stereoscan photographs.

My deep appreciation is also due to Dr J. D. Bradley, Commonwealth Institute of Entomology, London, who paid much inte. st in this study and gave valuable advice and suggestions. The help from other members of the Commonwealth Institute of Entomology is also acknowledged with thanks.

I wish to express my thanks to the following individuals and authorities for their kind cooperation in making possible the loan of type-specimens and other material, for providing useful information and for the courtesies given when it was possible to visit some of the museums.

Australia: Dr I. F. B. Common, Division of Entomology, C.S.I.R.O., Canberra. Austria: Dr F. Kasy, Naturhistorisches Museum, Vienna. Belgium: Dr L. A. Berger and Dr. P. Basilewsky, Musée Royal de l'Afrique Centrale, Tervuren. Canada: Dr E. G. Munroe and Dr A. Mutuura, Biosystematics Research Institute, Agriculture Canada, Ottawa. Denmark: Dr S. L. Tuxen and the late Dr Niels L. Wolff, Zoologisk Museum, Copenhagen. England: Mr E. Taylor, University Museum, Oxford. France: Dr P. Viette, Muséum National d'Histoire Naturelle, Paris. West Germany: Dr Th. Kruchow, Mrs Szygiarto and Dr H. Hohmann, Übersee Museum, Bremen; Dr U. Roesler, Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn; Dr H. G. Amsel, Landessammlungen für Naturkunde, Karlsruhe; Dr W. Dierl, Zoologische Sammlung des Bayerischen Staates, Munich. Japan: Dr T. Kumata and Dr C. Watanabe, Entomological Institute, Hokkaido University, Sapporo; Dr S. Moriuti, Entomological Laboratory, University of Osaka Prefecture, Sakai. Netherlands: Dr A. Diakonoff, Rijksmuseum van Natuurlijke Historie, Leiden; Mr H. Duffels and Mr W. N. Ellis, Zoölogisch Museum, Amsterdam. Nigeria: Dr G. H. Caswell, Institute for Agricultural Research, Ahmadu

Bello University, Samaru, Kaduna State. Sweden: Mr B. Gustavsson, Naturhistoriska Riksmuseet Stockholm. Switzerland: Dr Cl. Besuchet and Dr B. Hauser, Muséum d'Histoire Naturelle, Geneva. Taiwan: Dr C. B. Chen and Mr Tsong Hong Su, Taiwan Sugar Experiment Station, Tainan. Thailand: Dr M. R. Chakratong Tongyai; Dr Anuwat Wattanapongsiri; Dr R. Syamananda, Mr B. Meksongsee, Mrs V. Nithiuthai, Mrs B. Nanta, Mrs B. Laosinchai and the late Mr P. Pholboon, Department of Agriculture, Bangkok. U.S.A.: Dr J. F. Gates Clarke and Dr K. V. Krombein, Department of Entomology, National Museum of Natural History, Washington.

Dr E. G. Munroe, Biosystematics Research Institute, Agriculture Canada, has given much help during two of his visits to the BMNH.

Finally, I wish to express my sincere thanks to the Colombo Plan Authorities, who made this study possible by providing me with a grant, and to the Thai Government for granting me study leave in the United Kingdom.

The main characters of Schoenobiinae

There is no sharp line separating the Schoenobiinae from the other subfamilies of the Pyralidae. The main characters found in this subfamily are given below and the differences in these characters that occur in some genera are discussed. These are based on an examination of the type-species of most of the described genera in the subfamily.

The Schoenobiinae can be separated from the rest of the Pyralidae by the presence of vein *CuP,* which is developed only at the margin of the forewing (Fig. 6). This vein has been differently homologized by various authors. The character was first mentioned by Forbes (1926), but he called it *1A*. With one exception, all the species of the Schoenobiinae that I have been able to examine have this vein. *Schoenobius pyraustalis* Hampson, described from Argentina, is without vein *CuP,* but the other characters are typical of the Schoenobiinae. The presence of vein *CuP* in the forewing does not, however, automatically place a specimen in the Schoenobiinae. During the course of this work it was found that in *Leechia* South, *Neoschoenobia* Hampson and *Niphopyralis* Hampson, which all possess vein *CuP* and were retained in the Schoenobiinae by Munroe (1956) who referred to the vein as *1A,* lack the other main characters, especially those of the genitalia of this subfamily. Lange (1956: 76) described vein *1A* (*CuP* in the present paper) as being present at the margin of the forewing in the nymphuline tribe Argyractini.

The Schoenobiinae can be divided into two groups according to their wing venation. The first group is characterized by vein R_2 or R_5 or both being anastomosed with R_{3+4} in the forewing. In the second group, veins R_2 and R_3 are free and arise from the cell (Fig. 6).

The proboscis is always reduced. The labial and maxillary palpi are usually porrect, but in *Rupela* Walker the palpi are curved upwards, while in *Acentria* Stephens they are hanging downwards.

The abdomen in the Schoenobiinae is slender. Tympanal organs (Fig. 19) are always present and are situated laterally near the base of the abdomen. In the male, at the postero-median region of the 7th sternite (Fig. 20), there is a large flattened scale-tuft which extends over the 8th sternite (Fig. 21). This membranous area possesses another flattened tuft of shorter scales, the function of which is not known. No trace of a sense organ associated with either of these scale-tufts or with the membranous area of the 8th sternite could be found (Common, 1960). These scale-tufts are very characteristic and are present in most of the genera, though sometimes they are very thin, the exceptions being *Acentria, Calamoschoena* Hampson, *Ramila* Moore and *Tipanaea* Walker. There are at least two species outside the Schoenobiinae, *Endotrichella margaritifera* Hampson in the Pyraustinae and *Parthenodes pallidalis* South in the Nymphulinae, which also have this structure. In females of some schoenobiine genera, there is a tuft of hairs called the 'anal tuft' on the 7th abdominal segment, used for covering the eggs during oviposition.

The genitalia in both sexes (Figs 23-28) provide the most useful diagnostic characters at both the generic and the specific levels. In the male (Figs 23-25), the uncus is usually simple and has the shape of a tapering prong. In *Acentria* and *Calamoschoena* it is simple and plate-like. The

gnathos is also simple, but there are some differences: in *Adelpherupa* Hampson and *Promacrochilo* Błeszyński the gnathos is spinose, in *Patissa* Moore, *Argyrostola* Hampson, *Ramila* and some other genera it is slender and armed with teeth on the inner side near the tip, while in some other genera, e.g. *Scirpophaga, Schoenobius* Duponchel, *Catagela* Walker, *Donacaula* Meyrick and *Helonastes* Common, it is slender but without teeth. The articulation of the gnathos with the uncus or partly with the tegumen s ems to be of generic significance and is also correlated to the anastomosis of veins R_2 and R_5 with vein R_{3+4} in the forewing. When the gnathos articulates with the uncus, vein R_2 and R_5 are usually free. When it articulates partly with the tegumen, vein R_2 or R_5 or both anastomose with R_{3+4}. The shapes of the dorsal sclerotized thickening of the tegumen were first used by Common (1960) as generic characters, but are considered in this paper as specific differences. The subteguminal processes also provide good taxonomic characters at specific levels. The juxta is usually plate-like, but in *Donacaula* and *Schoenobius* it is broad-based and apically pointed, while in *Catagela* it is long and tapers uniformly from base to apical point.

The presence of coremata in males is also characteristic of the Schoenobiinae. They take the form of plate-like structures with long thread-like scales at their bases. The presence of coremata is correlated with that of a scale-tuft on the 7th abdominal sternite in the male. The four genera in which scale-tufts are absent also lack coremata.

In the female, the elongate, lobe-like, strongly setose papillae anales, together with the long, slender form of both the apophyses anteriores and the apophyses posteriores, are characteristic of the Schoenobiinae. The ostium bursae is usually membranous. The ductus bursae can be either membranous or lined with sclerotized plates. The point of origin of the ductus seminalis is of specific significance. The corpus bursae is membranous or lined inside with spine-like structures when examined by conventional light microscopy, but at very high magnifications (× 1000) it can be seen with the scanning electron microscope that the 'spines' are in fact invaginations of the wall membrane of the corpus bursae. Signa are absent in the subfamily except in *Crambostenia* Swinhoe and *Ramila*.

Genera here transferred from the Schoenobiinae

Erupa Walker	to Crambinae
Gabalaeca Walker	to Crambinae
Leechia South	uncertain subfamily
Lancia Walker	to Crambinae
Neerupa Hampson	to Crambinae
Neoschoenobia Hampson	to Nymphulinae
Niphopyralis Hampson	to Pyraustinae
Schoenerupa Hampson	to Crambinae
Tephroniopsis Amsel	to Tortricidae
Zolca Walker	to Crambinae

Species placed or described in *Scirpophaga* which are here transferred to other genera

Types or paratypes have been examined.

Schoenobius flavus (de Joannis) **comb. n.** VIETNAM: Hanoi.
Tipanaea intactella Walker **comb. rev.** BORNEO: Sarawak.
Patissa melitopis (Meyrick) **comb. n.** ZAIRE.
Patissa nigropunctata (Wileman & South) **comb. n.** TAIWAN.
Patissa percnopsis (Meyrick) **comb. n.** ZAIRE.
Patissa virginea (Zeller) **comb. n.** SOUTH AFRICA: Natal.
Patissa xanthoperas (Hampson) **comb. n.** SUMATRA.

Taxonomic history of the genus *Scirpophaga*

The genus *Scirpophaga* was erected as a monobasic genus by Treitschke in 1832 for the species, *Tinea phantasmatella* Hübner, 1796 (misspelled by Treitschke as *phantasmella*). According to

Treitschke the name *Scirpophaga* is derived from the name of the plant, *Scirpus*, and *phagein*, to eat. The main characters given for the genus are that the hindleg of the adult is long and the pupal stage is white, thin, and transparent, with the hindleg extending beyond the body. Duponchel (1836) added further characters of the genus and at the same time listed four other species as conspecific with *Scirpophaga phantasmella* [*sic*]: *Tinea dubia* Rossi, *Bombyx alba* Hübner, *Phalaena albinella* Cramer and *Eyprepia sericea* Passerini. Among these, *Phalaena albinella* Cramer has subsequently been transferred to *Rupela*, and the last species, *Eyprepia sericea*, cannot be traced from the original reference. In the same volume Duponchel erected one closely related genus, *Schoenobius*.

Zeller (1839) determined *Phalaena Alucita latidactyla* Hübner as conspecific with *Scirpophaga phantasmatella*, but he considered the specific names *phantasmatella* and *latidactyla* to be wrongly latinized, and so he used the name *alba* as the senior synonym.

Walker (1863*a*) wrongly synonymized *Topeutis* (misspelling of *Thopeutis* Hübner, 1818) with *Scirpophaga*. He discovered that *Phalaena praelata* Scopoli, 1763 had priority over *S. alba* and *S. phantasmatella*. At the same time he erected a new monobasic genus, *Apurima*, for the new species *Apurima xanthogastrella*. *Apurima* was subsequently placed as a synonym under *Scirpophaga* by Hampson (1895).

Because of the absence of a clear definition of the genus, the species now in *Scirpophaga* were, in the past, described in various other genera. For example, *excerptalis* and *incertulas* were described in *Chilo*, *innotata* in *Tipanaea*, *occidentella* in *Rupela*. Even in the same species, when sexual dimorphism occurred, the male and female were named as two separate species. Walker (1863*a*) described the male of a species as *Catagela admotella* and later (Walker, 1863*b*), the female as *Tipanaea bipunctifera*. (These two names were subsequently placed as junior synonyms of *Scirpophaga incertulas* (Walker).)

Zeller (1863) redescribed *Scirpophaga* and added six new species to the genus: *cinerea*, *gilviberbis*, *auriflua*, *chrysorrhoa*, *monostigma*, *leucatea*, which with *virginea* Zeller, *albinella* Cramer and the type-species *praelata*, made nine species in all. The present study has shown that only the first five species are true *Scirpophaga*, and that among these only *gilviberbis* is a valid name. In *Schoenobius*, Zeller described the male of *Scirpophaga incertulas* as *minutellus* and the female as *punctellus*. After this, *Scirpophaga* was mentioned in minor detail by many authors, e.g. Heinemann (1865), Moore (1867), Wocke *in* Staudinger (1871), Butler (1880) and Meyrick (1882; 1885; 1889; 1890). The last author (Meyrick, 1889) mentioned that in general *Schoenobius* could be separated from *Scirpophaga* by the relatively long labial palpi, but that in some forms, when there were no differences in length, the rough, erectly spreading tuft in the patagia of the male was a good character for distinguishing *Scirpophaga*. Moore (1886) cited *S. praelata* as type-species of *Scirpophaga*.

Before 1891 the subfamily status of Schoenobiinae had not been recognized and *Scirpophaga* was placed in different families according to various authors. Duponchel ([1846]) erected the family Schoenobidae to include *Scirpophaga* and *Schoenobius*. Walker (1863*a*) placed *Scirpophaga* in the Crambidae. Heinemann (1865) listed this genus under Chilonidae. Moore (1867; 1886) and Butler (1880) placed it under Crambidae. Guenée (1875) erected the family Scirpophagidae to include *Scirpophaga*. Meyrick (1882) placed the genus in the family Schoenobiadae [*sic*] but later (1885; 1886; 1889; 1890) he referred it to Hydrocampidae.

The group, including the three genera *Scirpophaga*, *Schoenobius* and *Donacaula*, was reduced to subfamily status by Ragonot (1891). Hampson (1895) was the first to attempt a classification of the Schoenobiinae. He separated them from the Crambinae by the absence of both the proboscis and a cubital pecten. He recognized 25 genera in the subfamily and, under *Scirpophaga*, listed *Apurima*, *Rupela* and *Tipanaea* as junior synonyms. (The last two were subsequently found to be distinct genera.) Twenty-two species were included in *Scirpophaga* and the synonyms of the species were also listed. This paper caused much confusion to later workers as subsequently it was found that most of the species listed as junior synonyms are actually distinct species, or are synonyms of different species to those under which they were listed. In the following year Hampson (1896) published more or less the same account of the Schoenobiinae as that which appeared in 1895. After this *Scirpophaga* was mentioned by Leech (1901), who

studied Chinese, Japanese and Korean material. Rebel *in* Staudinger (1901), studied Palaearctic material, Dyar (1903) North American material and Strand (1918) Taiwan material.

Dyar (1913), in studying the North American species, found that the species that were described under the name *Scirpophaga* in the Nearctic region are not true *Scirpophaga*. For this reason he transferred the North American species to *Rupela*. The genus *Rupela* has been studied in detail by Heinrich (1937).

When Hampson (1919*a*) included *Siga* Hübner [1820] in the subfamily, he changed the name from Schoenobiinae to Siginae because *Siga* had priority. Later in the same year he replaced *Scirpophaga* by *Topeutis* [*sic*] for the same reason, and also described five new species under this genus. Most authors still used *Scirpophaga* as the name of the genus. *Topeutis* [*sic*] remained in the Schoenobiinae for quite a long time. It was only recently that Błeszyński (1965) transferred it to the Crambinae.

In spite of the rejection of the generic name *Topeutis* [*sic*], many authors followed Hampson in changing the name of the subfamily to Siginae. These included Caradja (1925; 1932), de Joannis (1927; 1929) and Marumo (1934). De Joannis (1927) also mentioned species under *Topeutis* [*sic*] but later (1929) changed to *Scirpophaga*.)

Forbes (1923), in studying the Lepidoptera of New York, continued to use Schoenobiinae for the name of the subfamily. Later (1926) he pointed out that the Schoenobiinae could be separated from the other subfamilies by the presence of vein *1A* (*CuP* in the present paper) at the margin of the forewing. He also mentioned that *Siga*, which Hampson (1919*a*) included in Schoenobiinae (resulting in the changing of the name of the subfamily to Siginae), was actually a pyraustine. Shibuya (1928) studied the Schoenobiinae of Taiwan and listed four species in *Scirpophaga: praelata, nivella, excerptalis* and *brunnescens*, and also provided a key to separate these species by using the colour of the forewing and of the anal tuft. Meyrick (1933; 1935) and Turner (1937) placed *Scirpophaga* in the family Schoenobiadae [*sic*].

Munroe (1956), in studying Hampson's Schoenobiinae, supported Forbes (1926) in his opinion that the true Schoenobiinae could be separated from the Crambinae by the presence of vein *1A* at the margin of the forewing. Munroe listed 24 genera, including *Scirpophaga*, in the Schoenobiinae, and also discussed the position of some of the genera removed from the subfamily. This paper has clarified much of our knowledge of the subfamily.

Common (1960), in an important paper, classified the Australian species of *Scirpophaga* and *Schoenobius* by using genital structures. He assigned these species to six genera: *Scirpophaga, Helonastes, Niphadoses* Common, *Catagela, Tryporyza* and *Tipanaea*. Of these, *Helonastes, Niphadoses* and *Tryporyza* were described as new. In *Scirpophaga* he listed eight species, *chrysorrhoa, phaedima, limnochares, xantharrenes, imparella, helodes, percna* and *ochroleuca*. The present study has shown that only *S. phaedima, S. xantharrenes, S. imparella, S. percna* and *S. ochroleuca* are valid species.

Biology and host plants

Biology

The genus *Scirpophaga* contains a group of species whose larvae, so far as is known, are stalk borers of graminaceous crops, including sugar-cane. Some species (e.g. *S. nivella*) have a wide host-range, while others (e.g. *S. incertulas*) are restricted to single host plants. (See list of the host plants of *Scirpophaga*, p. 192.)

The life history of some of the economically important species, especially *S. incertulas* and *S. innotata*, has been studied by many entomologists (Shiraki, 1917; van der Goot, 1925). The female of *S. incertulas* lays eggs in a mass covered with scales from the anal tuft. The eggs are usually deposited on the under surface of the leaf. The number of the egg-masses laid is usually two or three and the number of eggs in each mass between 50 and 60.

The newly hatched larva bores into the stem. In the young plant it destroys the growing point and gives rise to a 'dead heart'. The shoots, except the lowermost two or three, become dry and turn pale yellow or straw-coloured, and come off easily when pulled. Finally, the tiller is killed. In the mature plant the larva bores into the stem above the highest node and disconnects the

young panicle, resulting in a 'white head'. In this case the plants may not be killed, but the quality of the ear heads formed on them is drastically affected.

When feeding on young plants the larva moves from plant to plant, but in the mature plant the larva tunnels down to the base of the stem and pupates.

The incubation period is from eight to nine days, the larval period 60 to 66 days and the pupal period nine to twelve days. The entire developmental period is 80 to 85 days, and the moth lives for three to seven days. These periods vary according to the temperature. There are usually five larval instars. The number of generations varies from two to six.

S. incertulas has been claimed to be the most serious pest in the world (Wardle, 1929, cited by Grist & Lever, 1969: 94). In Asia both this species and *S. innotata* are very serious pests of rice, while *S. excerptalis* is a pest on sugar-cane. In Africa, *S. occidentella* and *S. subumbrosa* give rise to many problems in rice pest control. There are also many species of this group which were not previously known to be pests of rice and sugar-cane because of confusion with the species mentioned above.

List of the host plants of *Scirpophaga*

The host plants and countries listed below are taken from the pin-label data of the material examined, or from the references cited.

Species	Host plants
praelata (Scopoli)	*Scirpus* sp. (Treitschke, 1832; Herrich-Schäffer, 1848); *Scirpus lacustris* (Zeller, 1863; Heinemann, 1865; Rehfous, 1906); *Scirpus validus, Scirpus mucronatus* and *Scirpus littoralis* (Common, 1960, cited under *Scirpophaga limnochares*); *Juncus* sp. (Marumo, 1934).
xanthopygata Schawerda	Unknown.
nivella (Fabricius)	*Oryza sativa* (India, Bangladesh, Thailand, Borneo); *Scirpus* sp. (India); *Cyperus* sp. (India); *Eleocharis* sp. (Hong Kong); *Cladium articulatum* and *Eleocharis dulcis* (Common, 1960, cited under *Scirpophaga chrysorrhoa*).
parvalis (Wileman)	Unknown.
phaedima Common	Unknown.
gilviberbis Zeller	At rest on *Oryza sativa* (Thailand).
percna Common	At rest on *Eleocharis dulcis* (Common, 1960).
imparella (Meyrick)	At rest on *Eleocharis dulcis* (Australia); *Cladium articulatum* and at rest on *Eleocharis sphacelata* (Common, 1960).
xantharrenes Common	At rest on *Eleocharis dulcis* (Common, 1960).
melanoclista Meyrick	Unknown.
excerptalis (Walker)	*Saccharum* sp. (India, Pakistan, Taiwan, Philippines); *Saccharum robustum* (New Guinea); *Saccharum officinarum* (Thailand); *Triticum* sp. (India); at rest on *Oryza sativa* (India).
magnella de Joannis	*Saccharum* sp. (Bangladesh); *Saccharum bengalense* (Pakistan); *Erianthus munja* (India); at rest on *Oryza sativa* (India).
xanthogastrella (Walker)	Unknown.
brunnealis (Hampson)	Unknown.
ochritinctalis (Hampson)	Unknown
bradleyi sp. n.	Unknown.
khasis sp. n.	Unknown.
flavidorsalis (Hampson)	Unknown.
melanostigma (Turner)	Unknown.
tongyaii sp. n.	Unknown.
occidentella (Walker)	*Oryza sativa* (Nigeria).
fusciflua Hampson	*Oryza sativa* (India).
ochroleuca Meyrick	Unknown.
virginia Schultze	*Oryza sativa* (Bangladesh).
subumbrosa Meyrick	*Oryza sativa* (Nigeria, Sierra Leone).
marginepunctella (de Joannis)	Unknown.
serena (Meyrick)	Unknown.

goliath Marion & Viette	Unknown.
lineata (Butler)	*Oryza sativa* (Marumo, 1934).
aurivena (Hampson)	Unknown.
auristrigella (Hampson)	Unknown.
incertulas (Walker)	*Oryza sativa* (Asia).
innotata (Walker)	*Oryza sativa* (Borneo) (van der Goot, 1925; Kapur, 1967); *Saccharum officinarum* (Philippines); *Oryza australiensis* (Common, 1960; Kapur, 1967).
gotoi sp. n.	Unknown.
whalleyi sp. n.	Found in rice fields (India).

Zoogeography of *Scirpophaga*

The genus *Scirpophaga* has a wide distribution in the Old World between the latitude 50°00′N (Bohemia, Czechoslovakia) and 34°53′S (Nowra, Australia). It does not occur in the New World where it is replaced by the genus *Rupela,* the species of which are similar externally to those of *Scirpophaga*. Species from the New World which have been placed in *Scirpophaga* properly belong in *Rupela* or an allied genus.

The normal zoogeographical regions and subregions are used in this paper. The subregions of the eastern part of the Oriental Region follow Gressitt (1956); the rest are mainly after Wallace (1876) with slight modifications. The Indian Subregion includes Sri Lanka in the south and Afghanistan and SW. Iran (Baluchistan) in the north-west.

The distribution patterns of the *Scirpophaga* complex

The Palaearctic Region

There are nine species present in this region. All subregions except the Siberian have representatives of *Scirpophaga*. Two species, *S. parvalis* and *S. gotoi,* are endemic in the Manchurian Subregion.

The distribution pattern of *Scirpophaga* in the Palaearctic Region agrees in general with that of other elements of the Palaearctic insect fauna mentioned by Gressitt (1958), confirming that the insect faunae of Europe and Japan are closely related. This is shown by the distribution of *S. praelata* and *S. xanthopygata,* both of which are present in the European and Manchurian Subregions, but are absent from the Siberian Subregion. It may be surmised that this is because of the deserts and high mountains in the south which form natural geographical barriers. In the Mediterranean Subregion only one species, *S. praelata,* is present.

The Manchurian Subregion is the richest; all nine species are present and two are endemic. The other seven species are shared with the Oriental Region. Japan was connected to the continental mainland in the Pleistocene period (Darlington, 1957) and was finally separated from the continent as a result of tectonic movement of the sea bottom at the end of the Pleistocene (Kostrowicki, 1969). The presence of two endemic species in the Manchurian Subregion, which includes Japan, suggests that Japan is one of the centres of radiation of this group.

The Ethiopian Region

There are eight species known from this region. All are endemic, five of them are in the *occidentella*-group, two in the *excerptalis*-group and one in the *praelata*-group.

The distribution patterns of *Scirpophaga* in the Ethiopian Region follow the distribution of grassland from the west across the continent south-eastwards. In the Malagasy Subregion (Madagascar) five species are found. Of these, one (*S. goliath*) is endemic, and four are shared with the subregions of the mainland. The low percentage of endemism of *Scirpophaga* in Madagascar is quite different from the Thyrididae, in which 27 species out of 30 occurring in Madagascar are endemic (Whalley, 1971). This suggests that most of the species of *Scirpophaga* occurring in Madagascar are probably comparatively recent arrivals.

The Oriental Region

This is the richest of all regions in the number of species of *Scirpophaga,* 22 being recorded of which 10 are endemic. Because this region has a large number of species, the subregions are discussed separately below.

The Indian Subregion. There are nine species in this subregion but only *S. whalleyi* is endemic. This species occurs in both Sri Lanka and India. Since Sri Lanka was presumably connected to India by land late in the Pleistocene period (Darlington, 1957), it is possible that *S. whalleyi* diverged from a closely related species, probably *S. incertulas,* during the interglacial phases which must have been of sufficient duration to allow speciation.

The Indo-Chinese Subregion. This subregion is the richest of all in the Oriental Region. There are 18 species, four of which are endemic. It should be noted that the endemic species occur mainly in the mountain areas of Assam and in the eastern Himalayas. This area is also in the range of distribution of many other species in the genus.

Taiwan has many species in common with the Himalayas and Burma. The similarity of the fauna of Taiwan to that of the Himalayas and Burma was mentioned by Gupta (1962) in his study of the Ichneumonidae. Taiwan also has Palaearctic elements, shown by the presence of *S. praelata* and *S. xanthopygata* which are mainly Palaearctic in distribution. Japan, which is now part of the Manchurian Subregion, was formerly connected with the south China part of the Oriental Region by a land bridge formed by the Ryukyu Islands and Taiwan. When Taiwan was separated, following the submergence which formed the present island chain, a Palaearctic element persisted in the mountains of Taiwan (Gressitt, 1956). This is probably the explanation of the presence of essentially Palaearctic species in Taiwan.

The Malayan Subregion. There are eight species occurring in this subregion, none of them endemic. All of these species except *S. innotata* are also present in the Indo-Chinese Subregion.

The Malayan Subregion includes the Malay Archipelago, Sumatra, Java and Borneo. These areas were once connected together, forming a land mass known as Sundaland. The connection and separation alternated according to the change in sea level during the several glaciations in the Pleistocene period (Zeuner, 1941; 1943). This condition facilitated speciation in various groups of insects in this area, for example some species of Lepidoptera of the subfamily Oretinae (Watson, 1967) and Hymenoptera of the family Ichneumonidae (Gupta, 1962).

Since there are no endemic species of *Scirpophaga* in this subregion, it may be that the species occurring in Sumatra, Java and Borneo are recent arrivals by over-water dispersal or have been introduced inadvertently by man.

The Philippine Subregion. Seven species are found in this subregion. As in the Malayan Subregion, no endemic species are present. All the species occurring here, except *S. xanthogastrella,* are also present in the Malayan Subregion. *S. xanthogastrella* has not been recorded from the Malayan Subregion but this is probably because the area has not been thoroughly collected.

The Celebes Transitional Zone. The seven species occurring in the zone represent a mixture of Oriental and Australian elements. *S. gilviberbis, S. lineata* and *S. incertulas,* which are Oriental species, do not occur further south or east beyond this zone. At the same time *S. percna,* which is an Australian element, does not extend north or west of the Celebes. Because of deep water around the island, Celebes was not connected to the mainland even during the Pleistocene regressions of the sea. The presence of the species of *Scirpophaga* in the Celebes is therefore presumably due to natural dispersal across the water barrier or, perhaps in some cases, to recent introduction.

The Papuan Subregion. This subregion includes New Guinea, the Solomon Islands and the Cape York Peninsula in Australia. Seven species occur in this subregion of which four, *S. nivella, S. excerptalis, S. flavidorsalis* and *S. melanostigma,* are mainly Oriental, and three, *S. percna, S. ochroleuca* and *S. innotata,* are mainly Australian in distribution.

New Guinea may have had connections with the mainland of Asia via the Malay Archipelago and have been connected to the Cape York Peninsula in north-east Australia during the Miocene-Pliocene tectonic movements (Gressitt, 1956). This would account for the Papuan Subregion having both Oriental and Australian elements.

The Polynesian Subregion. Only one species, *S. nivella*, is known from this subregion and it is found only in New Caledonia and Fiji. It is possible that this species arrived in these islands by natural dispersal across the water or it could have become established following the introduction of rice, which is one of its host plants, into New Caledonia by the French (Grist, 1965).

The Australian Region

The 10 species present in this region all occur on the Australian mainland. No species of *Scirpophaga* occurs in Tasmania or in the New Zealand Subregion.

In Australia the species of *Scirpophaga* occur mainly along the coast in the north and east, probably following the distribution of the tropical grassland.

Three species, *S. phaedima, S. imparella* and *S. xantharrenes*, are endemic. Because of their very similar genitalic structures *S. phaedima* may have evolved from *S. nivella*. *S. percna* and *S. innotata* probably originated in Australia from *S. gilviberbis* and *S. incertulas* respectively, and then spread to the other regions where they are found.

The presence of *S. praelata* in the Australian Region cannot be explained other than by postulating that this species was introduced, probably by the Chinese who came to Australia about 1869 to cultivate rice (Grist, 1965). This view is supported by the morphology of the genitalia, as the specimens of *S. praelata* from Australia have genitalia similar to those from Taiwan but slightly different from those of the European Region.

The distribution of *Scirpophaga* can be summarized as follows.

The Palaearctic Region: 9 species: two endemic, five shared with the Oriental Region, two shared with the Oriental and Australian Regions.

The Ethiopian Region: 8 species, all endemic to the region.

The Oriental Region: 22 species: ten endemic, five shared with the Palaearctic Region, five shared with the Australian Region and two with the Palaearctic and Australian Regions.

The Australian Region: 10 species: three endemic, five shared with the Oriental Region and two shared with the Oriental and Palaearctic Regions.

Of the total of 35 species, 22 occur in the Oriental Region and most are in the Indo-Chinese Subregion (18 species).

Centre of origin and evolution

Since in the Indo-Chinese Subregion, the number of species is greater than in the other subregions, it is possible to speculate that the centre of origin of *Scirpophaga* is in this subregion, especially in the eastern part of the Himalayas and Assam. The probable centre of origin of *Scirpophaga* in the Indo-Chinese Subregion would thus coincide with the place of origin of *Oryza sativa* (Chatterjee, 1951) which is the host plant of many species in this genus. It is doubtful that the pattern of distribution and the diversity of *Scirpophaga* follow the distribution of rice, but there is some coincidental evidence which supports such a possibility. Kratochvil (1956) mentions that the area in which rice can be grown is between 49°00′N in Czechoslovakia and 35°00′S in Australia. This is also more or less the same as the range of distribution of *Scirpophaga* which is between 50°00′N (Bohemia, Czechoslovakia) and 34°53′S (Nowra, Australia).

SCIRPOPHAGA Treitschke, 1832

Scirpophaga Treitschke, 1832: 55; Duponchel, 1836: 8, 16; Zeller, 1839: 170; Guenée, 1845: 334; Duponchel, [1846]: 311; Herrich-Schäffer, 1848: 52; Walker, 1863*a*: 145; Zeller, 1863: 1; Heinemann, 1865: 110; Meyrick, 1882: 151; 1885: 437; Moore, 1886: 387 [*Phalaena praelata* Scopoli designated type-species of *Scirpophaga*]; Meyrick, 1889: 520; 1890: 467; Hampson, 1895: 912; 1896: 45; Rebel, 1901: 11; Leech, 1901: 401; Hampson, 1919*b*: 319 [*Scirpophaga* erroneously cited as a junior synonym of *Topeutis* [*sic*] Hübner, 1818]; Shibuya, 1928: 60; de Joannis, 1929: 607; Marumo, 1934: 13; Jepson, 1954: 20; Common, 1960: 311; Kapur, 1967: 11. Type-species: *Tinea phantasmatella* Hübner, 1796, by monotypy [misspelled *Tinea phantasmella* by Treitschke; junior synonym of *Phalaena praelata* Scopoli, 1763].

Apurima Walker, 1863*a*: 194; Moore, 1886: 388. Type-species: *Apurima xanthogastrella* Walker, 1863, by monotypy. [Synonymized with *Scirpophaga* by Hampson, 1895: 912.]

Tryporyza Common, 1960: 339. Type-species: *Tipanaea innotata* Walker, 1863, by original designation. **Syn. n.**

Scirpophaga is very closely related to the five genera at present recognized in the Schoenobiinae: *Schoenobius, Niphadoses, Helonastes, Catagela,* and *Donacaula.* These genera, except *Donacaula,* have veins R_2 and R_5 of the forewing free, arising from the cell. In the male genitalia, all genera have the gnathos articulating with the uncus. *Scirpophaga* differs from *Schoenobius, Donacaula* and *Catagela* by the last three genera having a pointed juxta, and in *Niphadoses* the gnathos is shorter; in *Helonastes* the female genitalia have the inception of the ductus seminalis close to the corpus bursae. These differences have been noted during the present work, but it was not possible to study these genera in detail. These very small taxonomic differences suggest that further studies are needed to reassess the validity of *Schoenobius, Niphadoses, Helonastes, Catagela* and *Donacaula.*

Common (1960) erected the genus *Tryporyza* and designated *Tipanaea innotata* Walker as type-species. The characters used by him for separating this genus are found mainly in the genitalia. In the male the subteguminal process is curved, hook-like while in the female the ostium bursae is broad, thickened and strongly wrinkled. The present study shows that these characters are of specific significance and not of generic value as mentioned by Common. For this reason *Tryporyza* is placed as a synonym of *Scirpophaga.*

General morphology of *Scirpophaga*

In order to delimit the scope of this investigation, *Scirpophaga* is redefined as a group of Schoenobiinae resembling *Scirpophaga praelata* (Scopoli s. str. and having the following characters in common:

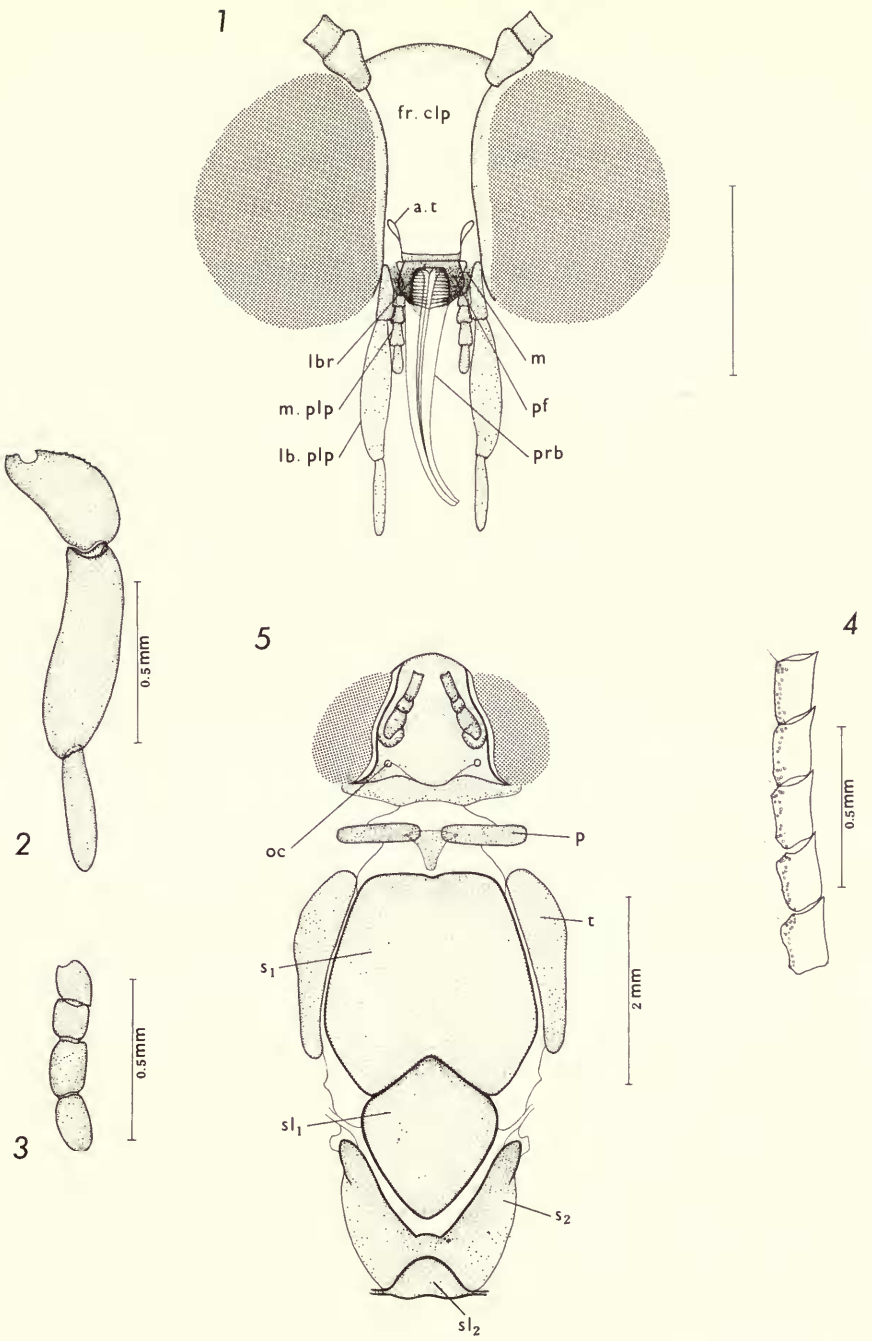
1, in the forewing veins R_2 and R_5 are free and arise from the cell;
2, an abdominal scale-tuft and coremata are present in the male;
3, an anal tuft is present in the female; the corpus bursae is more or less rounded and is usually densely lined with minute spines formed by the invagination of its wall membrane;
4, the juxta in the male is plate-like.

Head (Fig. 1). The general appearance is typical of the Ditrysia. The frons is shallowly rounded. The compound eyes are large, rounded and prominent. One ocellus is present on each side adjacent to the compound eye and posterior to the antenna. The chaetosema, a sensory organ which was first mentioned by Jordan (1923), is a round patch with sensory setae situated on each side near the ocellus. The antennae (Fig. 4) are filiform and weakly serrated. In the male the flagellum is finely ciliate and is approximately three-fifths the length of the forewing; in the female it is thinner and usually much shorter, about one-fifth to half the length of the forewing. The antenna is smooth-scaled dorsally and finely ciliated ventrally, the length of the cilia varying between species and usually shorter in the female.

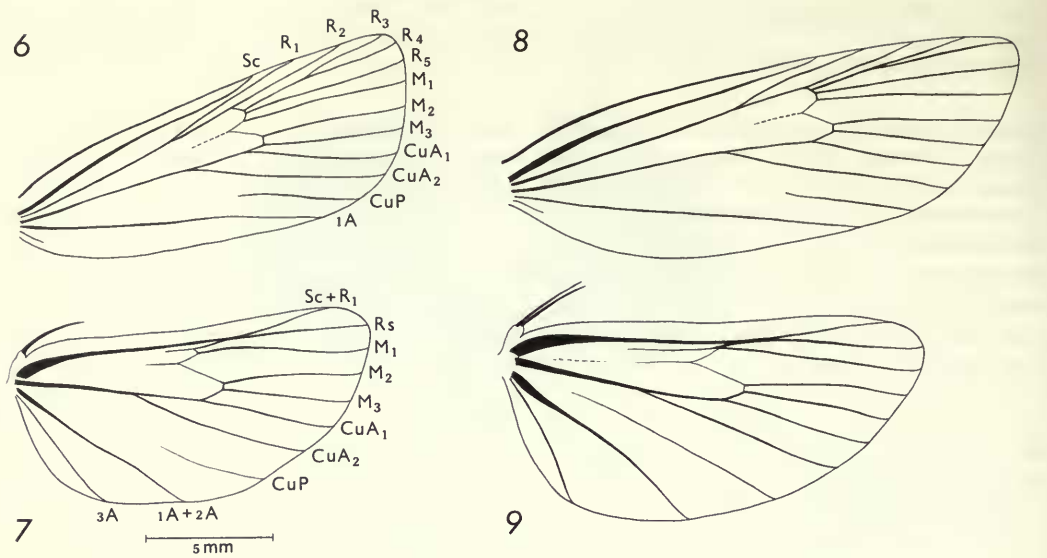
The labrum is a transverse, narrow plate with laterally projecting pilifers. The mandibles are vestigial, attaching to the genae and concealed behind the pilifers. The proboscis is very much reduced. The labial palpus (Fig. 2) and maxillary palpus (Fig. 3) are porrect, the former consisting of three segments, the second of which is the largest. The maxillary palpus is small and short, and consists of four segments whose combined lengths do not exceed half the length of the labial palpus. In the female, the length of both palpi is usually shorter than in the male. The length of the labial palpus varies between species.

Thorax (Fig. 5). The thorax is also typical of the Ditrysia. The patagia are a pair of thin, lobe-like structures on the prothorax. The mesothorax is large and prominent, with a well developed tegula at the base of the forewing. The metathorax is small. No characters of taxonomic value could be found on the thorax.

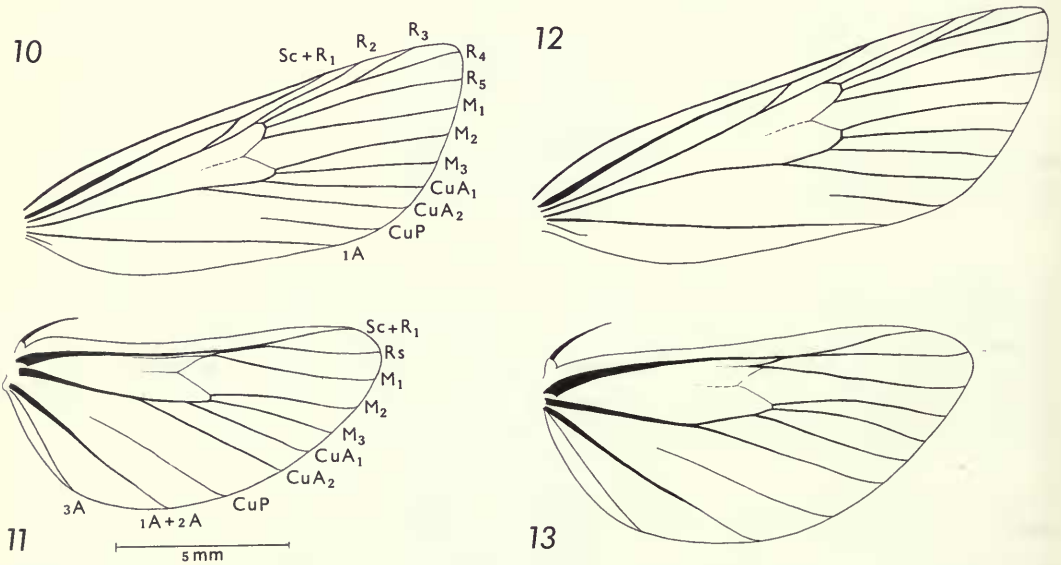
Legs (Figs 16–18). The legs are relatively long. The fore-tibia has a peculiar lamellate spur called the epiphysis at the middle of its inner surface. This spur is regarded as the vestige of an organ formerly developed for cleaning the antennae. The mid-tibia bears a pair of unequal, apical spurs the shorter of which is innermost. The hind-tibia possesses two pairs of spurs, the first situated close to the middle and the second apically. The tarsus consists of five segments, the apical one bearing a pair of claws.



Figs 1–5 Head and thorax of *Scirpophaga praelata* (Scopoli). 1, head (a.t = anterior tentorial pit; fr.clp = fronto-clypeus; lb.plp = labial palp; lbr = labrum; m = mandible; m.plp = maxillary palp; pf = pilifer; prb = proboscis); 2, labial palpus; 3, maxillary palpus; 4, antennal segment; 5, thorax, dorsal view (oc = ocellus; p = patagium; S_1 = mesoscutum; S_2 = metascutum; Sl_1 = mesoscutellum; Sl_2 = postnotum; t = tegula).



Figs 6–9 Fore- and hindwing of *Scirpophaga praelata* (Scopoli). 6, 7, male; 8, 9, female.

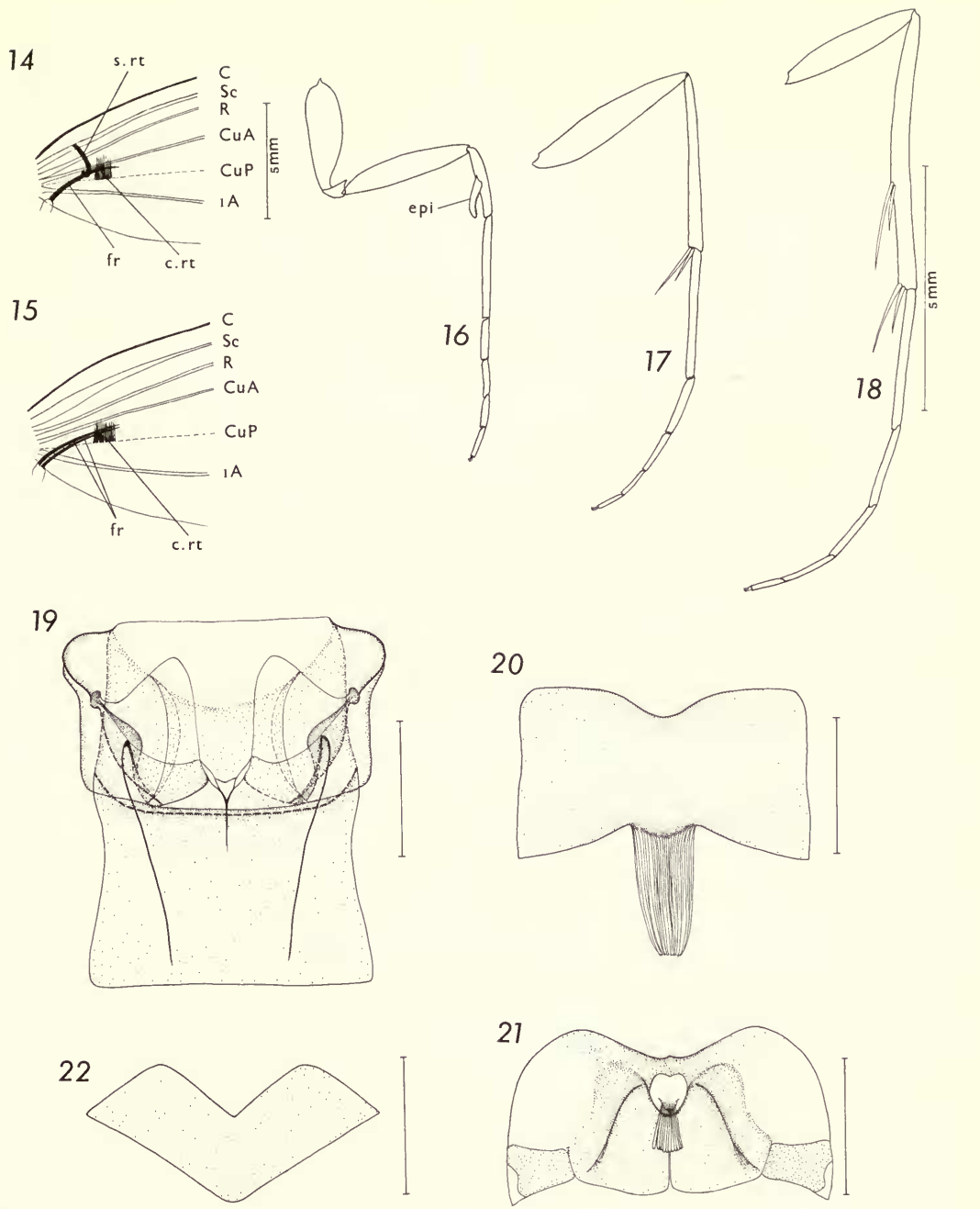


Figs 10–13 Fore- and hindwing of *Scirpophaga excerptalis* (Walker). 10, 11, male; 12, 13, female.

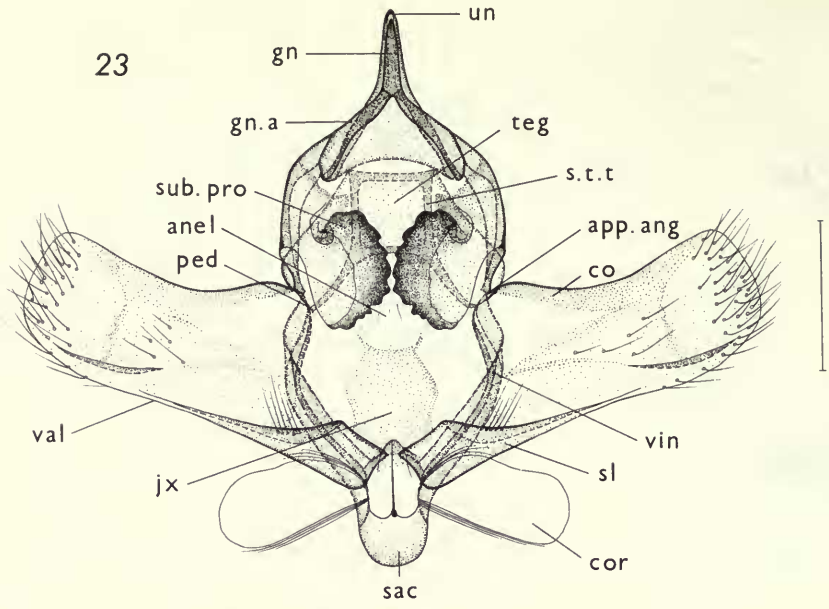
Wings (Figs 6–15). In the females the apex of the forewing is more pointed than in the males. The colour in general is whitish but there is variation, especially in the males in which the colour varies from pale ochreous white to ochreous. In some species the forewing of the male has markings but in the female it is usually a plain, pale colour.

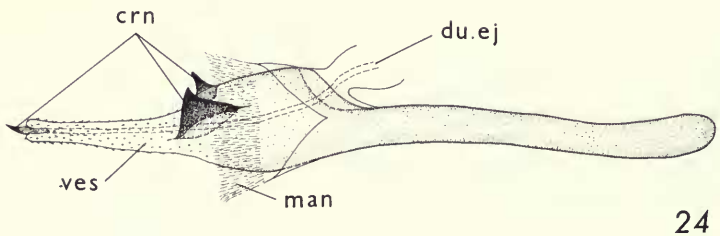
The wing coupling is of the frenate type (Figs 14, 15). A frenulum, subcostal retinaculum and cubital retinaculum are all present in the male, but only the frenulum and cubital retinaculum are found in the female. In the male the frenulum consists of a single bristle, but in the female it may be single or double.

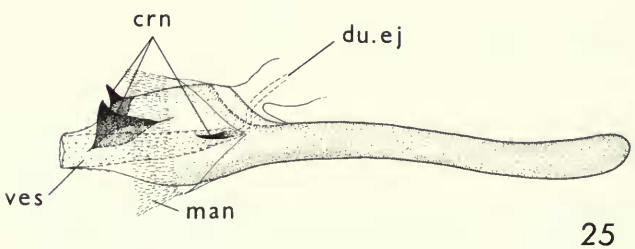
With regard to the wing venation, the terminology used here is that followed by Common (1970). In the



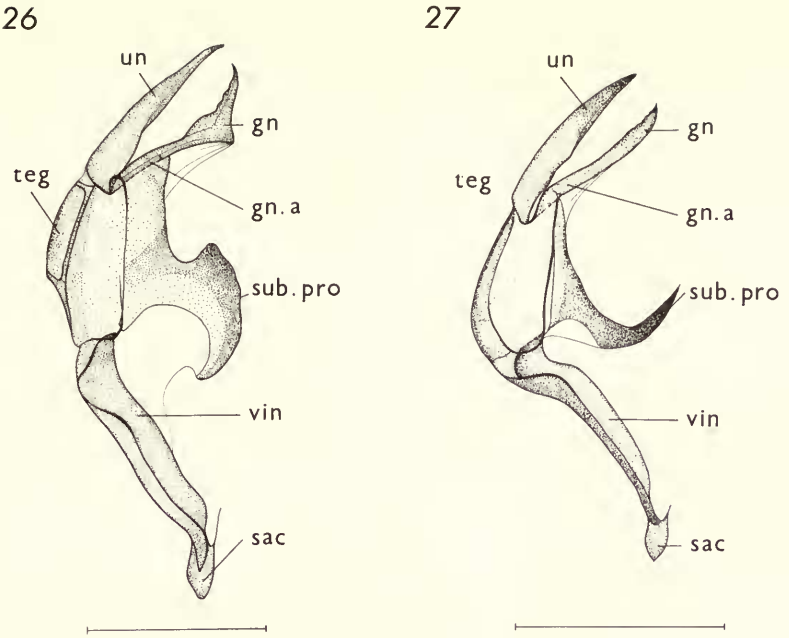
Figs 14–22 *Scirpophaga praelata* (Scopoli). 14, 15, wing-coupling apparatus of (14) male, (15) female. (fr = frenulum; c.rt = cubital retinaculum; s.rt = subcostal retinaculum. 16–18, legs; (16) foreleg (epi = epiphysis), (17) middleleg, (18) hindleg. 19–22, abdominal segments, (19) first abdominal segment, showing tympanal organs, (20) seventh abdominal sternite with scale-tuft, (21) eighth abdominal sternite, (22) eighth abdominal tergite.







Figs 23–25 Male genitalia of *Scirpophaga praelata* (Scopoli). 23, genitalia, aedeagus removed (anel = anellus; app.ang = appendices angulares; co = costa; cor = coremata; gn = gnathos; gn.a = gnathos arm; jx = juxta; ped = pedunculus; sac = saccus; sl = sacculus; s.t.t = sclerotized thickening of tegumen; sub.pro = subteguminal process; teg = tegumen; un = uncus; val = valva; vin = vinculum). 24, aedeagus, vesica protruded (crn = cornuti; du.ej = ductus ejaculatorius; man = manica; ves = vesica). 25, aedeagus, vesica inside (lettering as in Fig. 24).



Figs 26, 27 Lateral view of male genitalia of *Scirpophaga* species. 26, *S. praelata* (Scopoli), gnathos arms converging abruptly. 27, *S. excerptalis* (Walker), gnathos arms converging gradually. (Lettering as in Fig. 23.)

forewing, whether vein R_1 anastomoses or not with the subcosta is of specific significance. Vein R_2 is free, arising from near upper angle of the cell. Veins R_3 and R_4 are stalked, originating slightly above the upper angle of cell, R_3 at the costa near the apex and R_4 at the apex. Vein R_5 arises from the upper angle of the cell, diverging from R_4 terminally. M_1 approximates to R_5 basally; M_2 originates from above the lower angle of the cell and is more or less parallel to M_1; M_3 arises from the lower angle of the cell. Vein CuA_1 arises from well before the lower angle of the cell; CuA_2 originates at a point two-thirds to three-quarters along the cell. Vein *CuP* is short, developed only at the wing margin; *1A* is complete.

In the hindwing, vein $Sc+R_1$ ends on the costa near the apex, veins R_s and M_1 originate together from the upper angle of the cell, R_s then joins $Sc+R_1$ near the base, terminating on the termen near the apex, M_1 extends to the termen. Vein M_2 arises from above the lower angle of the cell and M_3 from its lower angle close to M_2. CuA_1 arises from before the lower angle of the cell and CuA_2 from about the middle of the cell. *CuP* is obsolete towards the base; $1A+2A$ is complete, *3A* is short, straight and complete.

Abdomen (Figs 19–22). In the male, the abdomen is slender and a scale-tuft is present on the 7th abdominal sternite (Fig. 20). In the female an anal tuft is present on the 7th abdominal segment. The colour of the anal tuft is a useful character for distinguishing some of the species.

Genitalia. Male (Figs 23–27). In the male the uncus and gnathos are simple and without any armature. The dorsal sclerotized thickening of the tegumen is of diagnostic importance at the species-group level. In the *praelata*-group it is rectangular, but is somewhat × -shaped in the *excerptalis*- and *occidentella*-groups and more or less triangular in the *incertulas*- and *lineata*-groups. The shape of the subteguminal process is used at the specific level as a taxonomic criterion. It can be of different shapes: plate-like, spine-like or tubercle-like; it is sometimes absent. The anellus is membranous and usually lined with minute spines but in the *occidentella*-group the spines are strongly sclerotized. The manica is lined with spines on the innerside near the aedeagus and is more or less like a broad ring. The arrangement of spines on the manica is sometimes of specific value. The juxta is always simple and in the form of a thin sclerotized plate. The aedeagus is usually elongate and with the cornuti on the vesica of various shapes, mostly spine-like. The valva is simple and not much differentiated but the costa and sacculus are easily seen. The saccus is rounded.

Female (Fig. 28). In the female the genitalia are typical of the Schoenobiinae. The extension of the 8th tergite ventrolaterally and the presence of a group of setae on them are characteristic of the *praelata*-group.

28

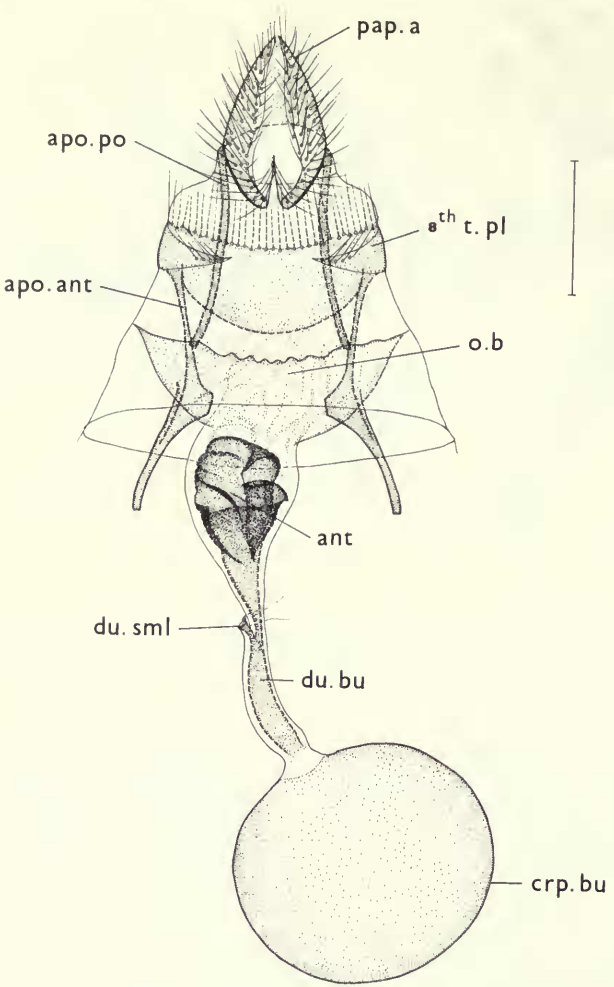


Fig. 28 Female genitalia of *Scirpophaga praelata* (Scopoli) (ant = antrum; apo.ant = apophyses anteriores; apo.po = apophyses posteriores; crp.bu = corpus bursae; du.bu = ductus bursae; du.sml = ductus seminalis; o.b = ostium bursae; pap.a = papillae anales; 8th t.pl = eighth tergal plate).

Key to species-groups of *Scirpophaga*

Males

1 Forewing with vein R_1 anastomosed with *Sc* (Fig. 10) 2
– Forewing with vein R_1 not anastomosed with *Sc* (Fig. 6) 6
2 Subteguminal process membranous, protruded or spine-like, if plate-like, manica with two groups of strong spines 3
– Subteguminal process lobe- or plate-like, manica with uniformly arranged minute spines . 4
3 Subteguminal process membranous, protruded (Fig. 93); dorsal sclerotized thickening of tegumen somewhat triangular; manica with uniformly arranged minute spines.
Aedeagus slender, a group of curved-spined cornuti present (Fig. 94)
***whalleyi*-group (*whalleyi*)** (p. 250)
– Subteguminal process a strongly sclerotized spine (except plate-like in *S. bradleyi*); dorsal sclerotized thickening of tegumen somewhat ×-shaped; manica usually with two groups of strong spines (Fig. 50) . . . . . ***excerptalis*-group** (p. 222)

4 Anellus lined with strong spines laterally (Fig. 69) . . . . . ***occidentella*-group (p. 233)**
– Anellus not lined with strong spines 5
5 Dorsal sclerotized thickening of tegumen ×-shaped; subteguminal process plate-like, broad-based, not strongly sclerotized (Fig. 67) . . . . . ***gotoi*-group (*gotoi*) (p. 249)**
– Dorsal sclerotized thickening of tegumen somewhat triangular; subteguminal process plate-like, strongly sclerotized, originating very close to appendices angulares (Fig. 83) ***lineata*-group (p. 240)**
6 Subteguminal process spine-like.
Dorsal sclerotized thickening of tegumen somewhat triangular; two adjacent unequal curved cornuti present (Figs 90, 92) ***incertulas*-group (p. 242)**
– Subteguminal process lobe- or plate-like 7
7 Dorsal sclerotized thickening of tegumen rectangular; anellus not lined with strong spines (Fig. 29) . . . . . ***praelata*-group (p. 203)**
– Dorsal sclerotized thickening of tegumen ×-shaped; anellus lined with strong spines (Fig. 69) ***occidentella*-group (p. 233)**

Females

1 Forewing with vein R_1 anastomosed with *Sc* (Fig. 12) 2
– Forewing with vein R_1 not anastomosed with *Sc* (Fig. 8) 6
2 Corpus bursae membranous or with very few spines 3
– Corpus bursae with dense spines 4
3 Ductus seminalis arising from ostium bursae at same level as ductus bursae (Fig. 113) ***occidentella*-group (p. 233)**
– Ductus seminalis arising from ductus bursae closer to ostium bursae than corpus bursae (Fig. 124) . . . . . ***whalleyi*-group (*whalleyi*) (p. 250)**
4 Ductus bursae with sclerotized lining throughout (Fig. 112) . . ***gotoi*-group (*gotoi*) (p. 249)**
– Ductus bursae with sclerotized lining only in part, usually membranous 5
5 Papillae anales wrinkled and leathery near tip (Fig. 123) . . . . ***lineata*-group (p. 240)**
– Papillae anales neither wrinkled nor leathery near tip (Fig. 105) . . ***excerptalis*-group (p. 222)**
6 Eighth tergal plate produced ventrolaterally with a group of setae; ductus bursae with sclerotized lining throughout (Fig. 95) . . . . . ***praelata*-group (p. 203)**
– Eighth tergal plate not produced ventrolaterally; ductus bursae usually membranous . . 7
7 Ostium bursae strongly wrinkled; corpus bursae usually lined with dense spines in basal three-quarters (Fig. 121) . . . . . ***incertulas*-group (p. 242)**
– Ostium bursae not wrinkled; corpus bursae membranous, without spines, with very few spines or densely lined with spines (Figs 113, 117, 118). . . . . ***occidentella*-group (p. 233)**

The *praelata*-group

Forewing with vein R_1 not anastomosing with *Sc*. Frenulum in male a single bristle, in female with single or double bristles.

GENITALIA ♂. Uncus and gnathos moderately long and slender; gnathos arms usually converging abruptly at middle and fused to form a prong with pointed apex; tegumen with dorsal sclerotized thickening rectangular, subteguminal process flattened, plate-like, usually with irregular sinuous margin; manica with dense uniformly arranged minute spines; aedeagus slender, vesica with minute spines, cornuti present.

GENITALIA ♀. Eighth tergal plate produced ventrolaterally with a group of setae on both sides; ostium bursae usually broad, membranous, wrinkled, lined internally with minute spines; ductus bursae with sclerotized lining throughout its length; antrum present in some species; ductus seminalis usually arising at middle of ductus bursae; corpus bursae lined with spines.

The *praelata*-group can be subdivided into two sections by the characters of the females: (1) the *praelata*-section in which a double-bristled frenulum is present and the ductus bursae is provided with an antrum, (2) the *gilviberbis*-section in which the female has a single-bristled frenulum and the ductus bursae is without an antrum. The *praelata*-section includes *S. praelata, S. nivella, S. xanthopygata* and *S. parvalis*. The *gilviberbis*-section contains *S. gilviberbis, S. melanoclista, S. percna, S. imparella* and *S. xantharrenes*. In *S. phaedima,* in which only the male is known, the genitalia are very similar to those of *S. nivella*. There is no doubt that *S. phaedima* is a member of the *praelata*-section.

Key to species of the *praelata*-group

Males

1 Forewing ochreous, usually with markings 2
– Forewing white, pale ochreous white or orange-yellow, without markings 6
2 Gnathos arms converging gradually (Fig. 27); subteguminal process rounded . . . 3
– Gnathos arms converging abruptly (Fig. 26); subteguminal process of various shapes . . 5
3 Aedeagus with one tridentate and two stout cornuti (Fig. 42) . . . ***gilviberis*** (p. 216)
– Aedeagus without tridentate cornutus, with one or four cornuti 4
4 Aedeagus with one slender cornutus (Fig. 40) . . . . . ***melanoclista*** (p. 221)
– Aedeagus with four cornuti (one slender and three stout) (Fig. 44) . . . ***percna*** (p. 218)
5 Aedeagus with three cornuti (one slender and two stout) (Fig. 34); subteguminal process usually with strongly sinuous margin (Fig. 33) . . . . . ***nivella*** (p. 211)
– Aedeagus with four cornuti (one slender and three stout) (Fig. 46); subteguminal process with very fine serrated margin (Fig. 45) . . . . . ***imparella*** (p. 219)
6 Aedeagus with four cornuti (one slender and three stout) (Fig. 38); subteguminal process rounded (Fig. 37) . . . . . ***parvalis*** (p. 214)
– Aedeagus with three cornuti (one slender and two stout); subteguminal process of various shapes 7
7 Forewing light orange-yellow; subteguminal process with smooth margin; valva short, truncate (Fig. 47) . . . . . ***xantharrenes*** (p. 221)
– Forewing white or pale ochreous white; subteguminal process usually with sinuous margin; valva elongate 8
8 Aedeagus with coarse spines on vesica (Fig. 36) . . . . . ***phaedima*** (p. 215)
– Aedeagus with minute spines on vesica 9
9 Aedeagus strongly swollen in apical third, with one slender and two large stout cornuti (Fig. 30) ***praelata*** (p. 205)
– Aedeagus slightly swollen in apical third, with one slender and two long-based cornuti, larger one usually with bifid tip (Fig. 32) . . . . . ***xanthopygata*** (p. 209)

Females

The female of *S. phaedima* is unknown.

1 Frenulum double; ductus bursae with antrum (Fig. 95) ***praelata***-section. 2
– Frenulum single; ductus bursae without antrum (Fig. 101) ***gilviberbis***-section. . . . 5
2 Antrum with two separated sclerotized plates (Fig. 97), or fused plates to form somewhat hemispherical structure (Fig. 98). . . . . ***nivella*** (p. 211)
– Antrum not as above 3
3 Ductus bursae long and slender (Fig. 96) . . . . . ***xanthopygata*** (p. 209)
– Ductus bursae broad, strongly sclerotized 4
4 Ductus bursae between antrum and ductus seminalis relatively short, slightly evaginated medially (Fig. 99) . . . . . ***parvalis*** (p. 214)
– Ductus bursae between antrum and ductus seminalis relatively long, not evaginated medially (Fig. 95) . . . . . ***praelata*** (p. 205)
5 Underside of forewing suffused with fuscous tinge. 6
– Underside of forewing not suffused with fuscous tinge 7
6 Forewing with dark fuscous tinge along costa; ductus bursae with length of sclerotized plate between ostium bursae and ductus seminalis about twice the width (Fig. 104) ***xantharrenes*** (p. 221)
– Forewing without dark fuscous tinge along costa; ductus bursae with length of sclerotized plates between ostium bursae and ductus seminalis about the same as the width (Fig. 103) ***imparella*** (p. 219)
7 Groups of setae always present posterior to ostium bursae; ductus bursae with sclerotized plate between ostium bursae and ductus seminalis long, tube-like, length approximately five times the width (Fig. 100) . . . . . ***melanoclista*** (p. 221)
– Groups of setae not present posterior to ostium bursae; ductus bursae with length of sclerotized plate between ostium bursae and ductus seminalis less than three times the width . . 8
8 Ductus bursae with sclerotized plate tapering towards ductus seminalis (Fig. 102) . ***perena*** (p. 218)
– Ductus bursae with sclerotized plate tapering towards both ductus seminalis and ostium bursae (Fig. 101) . . . . . ***gilviberbis*** (p. 216)

Scirpophaga praelata (Scopoli, 1763)
(Figs 29, 30, 95, 125, 126, Map 1)

Phalaena praelata Scopoli, 1763: 198. Syntype(s), YUGOSLAVIA: Carniola [Krain] (probably destroyed, Horn & Kahle, 1936: 252) [not examined].

Tinea dubia Rossi, 1790: 208. Syntype(s), ITALY (no precise locality) (depository unknown) [not examined]. [Synonymized with *praelata* Scopoli by Werneburg, 1864: 254.]

Phalaena Alucita latidactyla Hübner, 1790: 27, pl. 4, fig. U. Syntype(s), ITALY (no precise locality) (depository unknown) [not examined]. [Synonymized with *praelata* Scopoli by Werneburg, 1864: 147.]

Tinea phantasmatella Hübner, 1796: 23, pl. 8, fig. 56. LECTOTYPE ♂, ITALY [Florence (Freyer, 1833)] (*Mazzola*) (NM,Vienna, Type Hb. 56), here designated [examined]. [Synonymized with *praelata* Scopoli by Walker, 1863*a*: 145.]

Topeutis phantasmatalis (Hübner) Hübner, [1825]: 366.

Bombyx alba Hübner, [1828]: pl. 74. figs 309–312; Freyer, 1833: 174, pl. 9, figs 1, 2, pl. 32, fig. 1; Herrich-Schäffer, 1848: 52. Syntype(s), [EUROPE] (depository unknown) [not examined]. [Synonymized with *praelata* Scopoli by Walker, 1863*a*: 145.]

Scirpophaga phantasmella: Treitschke, 1832: 56; 1835: 156; Duponchel, 1836: 18, pl. 267, figs 1a, 1b. [Misspellings.]

Scirpophaga phantasmella var.; Freyer, 1836: 119, pl. 168, figs 1, 2.

Scirpophaga alba (Hübner) Zeller, 1839: 170.

Scirpophaga phantasmella var. *grisea* Guenée, 1845: 334. Syntype(s), YUGOSLAVIA: Carniola [Krain] (depository unknown) [not examined].

Scirpophaga praelata (Scopoli) Walker, 1863*a*: 145; Zeller, 1863: 1; Heinemann, 1865: 110; Wocke, 1871: 216; Butler, 1880: 690; Moore, 1886; 387; Hampson, 1895: 913; Rebel, 1901: 11; Shibuya, 1928: 60 (partim); Marumo, 1934: 2, 15, pl. 1, fig. 3, pl. 2, fig. 7, pl. 3, figs 4, 8, pl. 4, fig. 3; Caradja, 1938*b*: 255; Szent-Ivany & Uhrik-Mészáros, 1942: 130.

Scirpophaga cinerea Zeller, 1863: 1; Heinemann, 1865: 110; Rebel, 1901: 11 (as abnormal form of *praelata* Rebel). Syntype(s), YUGOSLAVIA: Carniola [Krain] (depository unknown) [not examined].

Scirpophaga praelata ab. *cinerea* Zeller; Szent-Ivany & Uhrik-Mészáros, 1942: 130.

Scirpophaga limnochares Common, 1960: 318, figs 4E, 4F, 7C, pl. 1, figs 5, 6. Holotype ♂, AUSTRALIA: N.S.W., Coraki, 10. Jan. 1958 (*I. F. B. Common*) (ANIC, Canberra, genitalia slide no. P. 123) [examined]. **Syn. n.**

♂ (Fig. 125). 26–36 mm. Pale ochreous white. Length of labial palpus approximately 1·2 times diameter of compound eye. Forewing pale ochreous white, underside fuscous; hindwing pale ochreous white, underside suffused with fuscous in costal half.

♀ (Fig. 126). 26–49 mm. White. Fore- and hindwing white on both surfaces; frenulum double-bristled. Anal tuft greyish white.

GENITALIA ♂ (Figs 29, 30). Subteguminal process large, flattened, with irregular sinuous margin; valva elongate, apex rounded; aedeagus strongly swollen in apical third, vesica densely lined with minute spines, one slender and two stout cornuti present.

GENITALIA ♀ (Fig. 95). Ostium bursae broad, membranous; ductus bursae relatively broad, antrum present.

REMARKS. In the original description of *latidactyla,* Hübner (1790) stated that he had specimens from the collections of Kirchmair in Vienna and Gerning in Frankfurt. The figure has the general appearance of *praelata* except that the anal tuft is yellow instead of greyish white as in *praelata.* This yellow anal tuft was commented on by Treitschke (1832), who pointed out that he had never seen it in nature. He doubtfully included *latidactyla* Hübner as a synonym of '*phantasmella*' Hübner (misspelling of *phantasmatella*). Although numerous specimens from western Europe have been examined during this study, I have never seen any with the anal tuft yellow; all have the greyish white anal tuft of *praelata.* There seems no doubt that *latidactyla* Hübner is a synonym of *praelata,* as stated by Werneburg (1864), and that in Hübner's figure the colour of the anal tuft is incorrect.

Werneburg (1864) placed *dubia* Rossi in synonymy under *praelata.* The original description confirms this synonymy, especially in the following characters: '*tota nivea immaculata. . . anus densis pilis albis lanatus in feminis . . . tarsi fusci apice albo annulati.*'

The original published data on *alba* Hübner consist solely of the figures of both sexes, showing

both upperside and underside of the wings. The figures of *alba* are identical with *praelata,* and the existing synonymy is confirmed.

The name var. *grisea* was proposed by Guenée for a specimen considered by Freyer (1836) to be a variety of *phantasmella* (misspelling of *phantasmatella*). Freyer examined this moth under the name '*Scirpophaga cinerea* Kokeil', and considered it to be merely an abnormal form of *phantasmella* [*sic*]. Freyer mentioned that, although there was a difference in the colour of the forewing, it had the same mode of life and habitat.

Zeller based his description of *cinerea* on Freyer's figure (Freyer, 1836: pl. 168, figs 1, 2) and considered it as a distinct species. It was treated as an abnormal form of *praelata* by Rebel (1901) and Szent-Ivany & Uhrik-Mészáros (1942).

In the male of *S. praelata,* individual variation is found in the coloration of the forewing. The colour varies from pale ochreous white to pale ochreous. Two specimens from Japan have pale greyish ochreous forewings. In the male genitalia there is some individual variation in the length of the uncus and gnathos and in the depth of the sinuations in the margin of the subteguminal process. The coloration in the female is constant.

In the extensive material examined of this species, most of the specimens from the Mediterranean Subregion (Syria, Lebanon and Turkey) were found in both sexes to be smaller than specimens from other regions. Female specimens from the Manchurian Subregion and Taiwan have the forewing more pointed and the anal tuft shorter and less dense than in specimens from the European Subregion. The genitalia also show slight differences. All six available male specimens from the Mediterranean Subregion have the subteguminal process pointed posteriorly, while the only available specimen from Iran has a more or less rounded subteguminal process as in European specimens. No differences in the genitalia could be found in the three available male specimens from Japan when these were compared with European specimens. Three male specimens from Taiwan have the subteguminal process pointed posteriorly and with a narrower sclerotized band in the margin than in the European specimens, while the fourth specimen is intermediate, rounded but with a narrower sclerotized band in the margin of the subteguminal process. In the female genitalia, specimens from the Manchurian Subregion and Taiwan have the ductus bursae slightly shorter than those from the European Subregion. No differences could be found between female specimens from the Mediterranean and European Subregions. More male specimens from the Asiatic region need to be examined before a decision can be reached regarding any subspecific status.

The Australian specimens which Common (1960) described as *Scirpophaga limnochares* have greyish ochreous forewings in the males. In the genitalia, the subteguminal process is slightly pointed posteriorly and the sclerotized band at the margin is narrow as in the specimens from Taiwan. No difference could be found in the female, except that the ductus bursae of Australian specimens is slightly longer than in those from Taiwan. It is probable that the Australian specimens were introduced from Taiwan or Japan.

This species is the only representative of the *Scirpophaga* complex found in the European and Mediterranean Subregions. In western Asia it can only be confused with *S. xanthopygata* but in China, Japan and Taiwan it has been confused with many species. The genitalia, especially the shape of the cornuti in the male and the broad ductus bursae in the female, are characteristic in this species.

BIOLOGY (for host plants see p. 192). A brief account of the life history of *Scirpophaga praelata* has been given by Treitschke (1832) and a more complete one by Rehfous (1906). The two accounts do not agree in some respects. Treitschke stated that the newly hatched larva first bored into the upper part of the stem of the sedge, then tunnelled downwards and formed a cavity in the root. It then ascended within the stem and made a hole in the wall of the latter above the water level. The hole was covered with a thin membrane and served as an exit for the imago. Pupation took place in the stem below the water level. The chamber where it pupated was about 4 cm long. The larva, pupa and adult were present at the same time. Thus, according to Treitschke, the life history of this species involves only one stem of the plant and there is more than one generation in a year.

However, from the study of Rehfous, it appears that there is only one generation a year and

the life history involves two stems of *Scirpus lacustris,* one in winter and the other in spring. He observed that the males were attracted to light but the females could only be caught on the host plants. Mating and oviposition took place at night. The eggs were laid in a mass on the stem of the food plant about 60–70 cm above water level and were covered with a layer of scales from the anal tuft of the females. The egg was soft, elongate, translucent and yellowish, measuring $0{\cdot}75 \times 0{\cdot}25 \times 0{\cdot}25$ mm.

Hatching began 15 days after oviposition. The newly hatched larva bored into the stem and tunnelled to the root. It took about 15 days to reach the root where it stopped feeding and passed the winter from the end of August. When the hibernation chamber was completed, the larva closed the top with impermeable silk to prevent water penetrating when the aerial stem died and was carried away by the current. In the hibernation chamber the larva underwent the second moult.

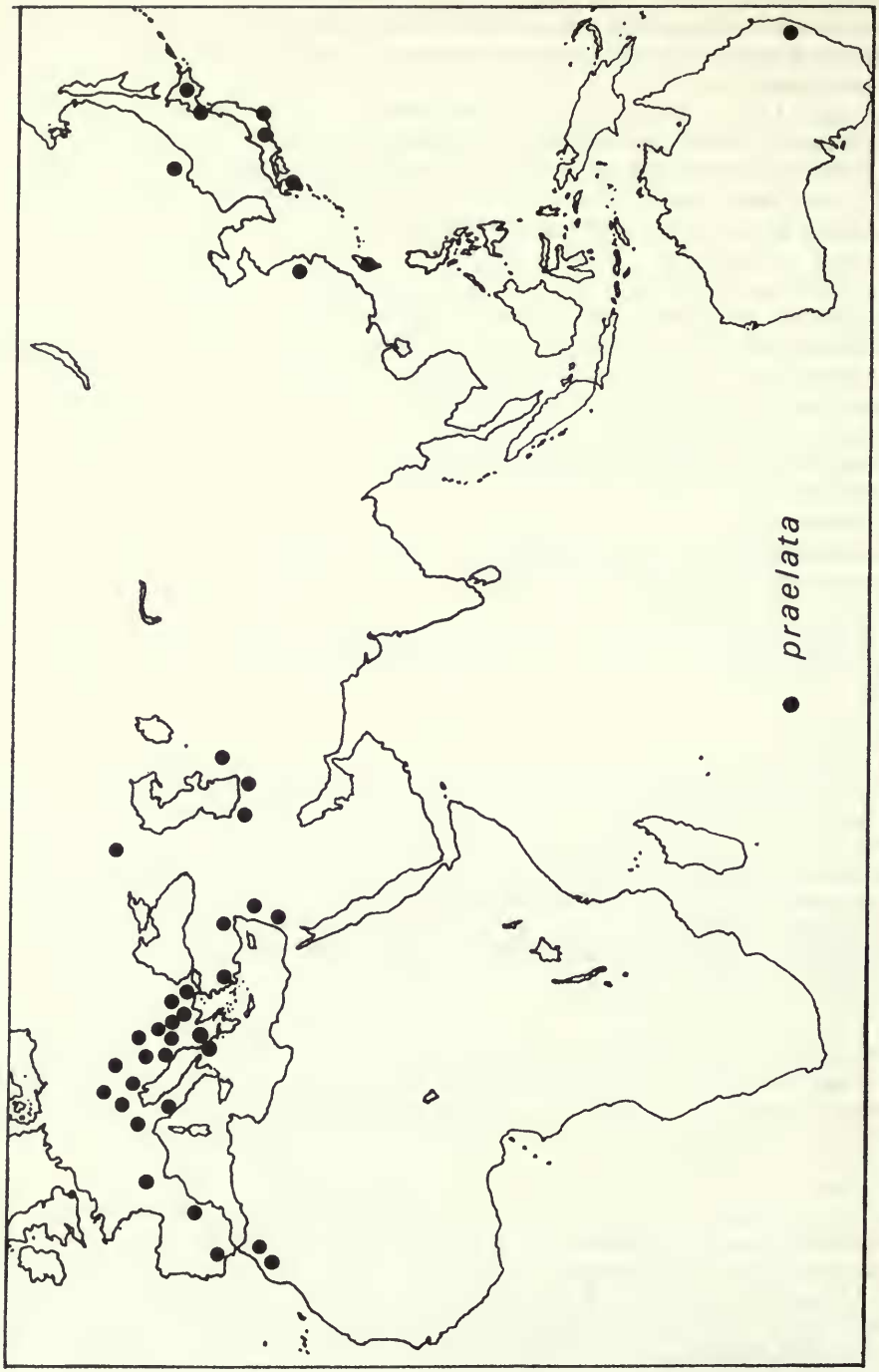
In spring, towards the end of April, when the stems were sprouting, the larva left the hibernation chamber and bored into a new stem, where it tunnelled down to the root; during this time it moulted for the third time. After reaching the root the full-grown larva tunnelled up again for a variable distance to make an exit for the adult, usually below the water level. The pupal chamber was 2 cm long and situated about 3–4 cm below the exit hole, and both ends were covered with an impermeable substance. The adult emerged from the hole under the water, passed through the water and climbed up the stem. It was noticed that in the spring there was only one larva per stem, while in winter there were usually three or four larvae and sometimes as many as nine.

Although Rehfous did not mention how long it took to complete the life cycle, his observation that the larva overwintered suggests that there was only one generation in a year.

DISTRIBUTION. Japan, Taiwan, China, U.S.S.R., Iran, Syria, Lebanon, Turkey, Greece, Bulgaria, Rumania, Czechoslovakia, Hungary, Yugoslavia, Austria, Italy, France, Spain, Morocco, Algeria, Australia.

MATERIAL EXAMINED

Japan: 1 ♀, Hakodate, viii.1866 (*Leech*) (BMNH); 1 ♀, Hakodate (BMNH); 1 ♀, Hokkaido, Kamuikotan, 17.vii.1952 (*Mutuura*) (CNC, Ottawa); 1 ♂, 1 ♀, Junsai Numa, Oshima, Hokkaido, 25, 29.vii.1896, 1902 (*Wileman*) (BMNH); 1 ♂, Amamiosima, Santarotoge, Kyushu, 28.iv.1960 (*Kodama*) (CNC, Ottawa); 1 ♂, Amami, Shinmura, 28.iv.1960 (*Mutuura*) (CNC, Ottawa); 13 ♀, Hamamatsu, Honshiu, 13.vi.1963 (*Mutuura*) (CNC, Ottawa); 1 ♀, Yokohama, 16.viii.1911 (*Höne*) (MAK, Bonn). **Taiwan**: 14 ♀, Anping, vii.–26.ix.1905 (*Wileman*) (BMNH); 1 ♀, Kanshirei, iv.1909 (BMNH); 1 ♂, Takow, 16.viii.1904 (*Wileman*) (BMNH); 3 ♂, 10 ♀, Tainan, vi.–xi.1904,1905,1906 (*Wileman*) (BMNH); 1 ♀, no further data (BMNH). **China**: 1 ♀, Hsü-Chia-Hui (Zi Kaweg) (MNHN, Paris). **U.S.S.R.**: 1 ♀, Ussuri, Nicolsk, vii.1912 (*Moltrecht*) (BMNH); 1 ♀, 1916 (*Dworzak*) (NM, Vienna); 1 ♀, Ussuri Railway, Chabarovsk, 22.vi.1910 (*Borsow*) (BMNH); 1 ♀, Ussuri, 1913 (*Moltrecht*) (BMNH); 1 ♂, 1 ♀, Sarepta (BMNH); 1 ♂, 1 ♀, Geok-tepe, iv.1903 (LN, Karlsruhe); 2 ♀, Geok-tepe, 23.v.1903 (MNHN, Paris). **Iran**: 1 ♂, 1 ♀, South Caspian, Shahi, 19–26.viii.1961 (*Sutton*) (BMNH); 1 ♀, Enzeli, 19.vi.1919 (*Buxton*) (BMNH). **Syria**: 1 ♀, Tartus, 16.vi.1950 (LN, Karlsruhe); 2 ♂, 1 ♀, no further data (MNHN, Paris). **Lebanon**: 1 ♂, 6 ♀, Beirut (BMNH). **Turkey**: 2 ♂, 2 ♀, Amanus S., Yüksek Dagh, viii.1931, 1–15.v.1932 (ZSBS, Munich); 1 ♂, Kusadasi, 22.vii–11.viii.1967 (*Roesler*) (MAK, Bonn); 2 ♂ [unreadable data] (MAK, Bonn); 1 ♀, Adana, Anatolia, 3–12.vi.1934 (BMNH). **Greece**: 1 ♀, Kerkira (Corfu), 8.vii.1902 (BMNH); 1 ♂, Macedonia, Ochrid, 12–24.vi.1939 (*Lunak*) (NM, Vienna); 1 ♂, 1 ♀, Macedonia, Ochrid, 27.vi.1954 (*Thurner*) (ZSBS, Munich); 2 ♂, 5 ♀, Macedonia, 29.v.–2.vii.1918 (*Wolley-Dod*) (BMNH). **Bulgaria**: 1 ♂, 1 ♀, Sistov, 10–20.vii.1933 (ZSBS, Munich). **Rumania**: 1 ♀, Bucarest (*Montandon*) (MNHN, Paris); 1 ♀, Treskovac, nr Szvinicza, Krosso Szeroeny C., 26.vii.1912 (BMNH); 1 ♂, Szvinicza, Krosso Szeroeny C., 13.vii.1912 (BMNH); 1 ♀, Varniseo, nr Szvinicza, Krosso Szeroeny C., 580 m, 3.vii.1962 (BMNH). **Czechoslovakia**: 1 ♂, 1 ♀, Bohemia, 15.vii.1912 (ZM, Amsterdam). **Hungary**: 2 ♀, Budapest, 18.vii., 2.viii.1898 (BMNH); 1 ♂, 1 ♀, Budapest (ZSBS, Munich); 1 ♂, 4 ♀, Nagy Ngir nr Kecskemet, 7.vi.–30.vii.1915 (*Predota*) (BMNH); 3 ♀, Szikra nr Kecskemet, 14.vii.1914 (*Predota*) (BMNH); 2 ♀, Nyirbator, 5.vii.1915 (*Predota*) (BMNH); 1 ♂, 5 ♀, Hortobagy, Hajdu C., 8–14.vii.1912 (*Predota*) (BMNH); 2 ♂, 4 ♀, P. Peszer, Pest C., 8–18.vi.1911 (BMNH); 6 ♂, 3 ♀, 20–23.vi.1913 (BMNH); 1 ♂, 1 ♀, Peszer, Turgan, 10.vii.1928 (*Daniel*) (ZSBS, Munich); 5 ♀, Flamunda, Deliblat, 16–25.vi.1909,1911 (BMNH); 1 ♂, Erkeseru Bihar C., 18.vii.1912 (BMNH); 1 ♀, Csehtelek, Bihar C., 27.vii.1911 (BMNH). **Yugoslavia**: 10 ♂, 24 ♀, Slavonien, Kupinovo, 24.vi.–1.viii.1913



Map 1

(*Predota*) (BMNH); 3 ♂, 3 ♀, Slavonien, Assanjo, 22–28.vi.1913 (*Predota*) (BMNH); 2 ♂, 3 ♀, Slavonien, Obrez, 19.vi.–29.vii.1913 (*Predota*) (BMNH); 1 ♀, Pokostane, 20.vi.1965 (ZSBS, Munich); 1 ♀, Fiume (Rijeka) (*Krauss*) (NM, Vienna); 5 ♂, 3 ♀, Drava Sarvas, Szerem C., 6.vii.–20.viii.1909 (BMNH). **Austria**: 1 ♂, 2 ♀, Hansag Umg., 29.vi.–7.viii.1921 (*Predota*) (BMNH); 1 ♀, Burgenland, Hansag, 26.vi.1954 (*Kasy*) (NM, Vienna); 1 ♀, Gramatneusiedl, Fürbachwiesen, 18.vii.1960 (*Kasy*) (NM, Vienna); 1 ♀, Graz, 22.vii.1917 (ZSBS, Munich); 1 ♀, Graz-Styria, 4.vii.1904 (ZM, Amsterdam); 1 ♂, 1 ♀, Marchfeld, vii.1939 (*Lunak*) (NM, Vienna); 1 ♂, 1 ♀, Prater, iii.1876 (BMNH); 2 ♂, 1 ♀, Prater, xii.1881 (BMNH); 1 ♀, Burgenland, Zitzmannsdorfer Wiesen, 28.vii.1956 (*Kasy*) (NM, Vienna); 1 ♀, Burgenland, Zitzmannsdorfer Wiesen (*Reisser*) (LN, Karlsruhe). **Italy**: 1 ♂, Le Sarche, vii.1897 (*Rebel*) (NM, Vienna). **France**: 1 ♂, Feurs, vii.1909 (BMNH). **Spain**: 2 ♀, Valencia, 10–11.vi.1960 (*Sattler*) (ZSBS, Munich); 1 ♀, Andal, Huelva, El Rocio, 15.iv.1938 (*Marten*) (NM, Vienna). **Morocco**: 2 ♂, Rabat, 1914 (*Théry*) (BMNH). **Algeria**: 1 ♀, Sebdou, iv.1913 (*Théry*) (BMNH). **Australia**: 1 ♂, 2 ♀ (allotype and paratypes of *Scirpophaga limnochares* Common), N.S.W., Coraki, at rest on *Scirpus validus*, 12.iii.1958 (*Common*) (ANIC, Canberra).

Scirpophaga xanthopygata Schawerda, 1922 **stat. n.**
(Figs 31, 32, 96, 127, 128, Map 2)

[*Scirpophaga excerptalis* Walker sensu Leech, 1901: 402 (partim). Misidentification]

Scirpophaga praelata var. *xanthopygata* Schawerda, 1922: 11; Caradja, 1938*a*: 91. LECTOTYPE ♀, U.S.S.R: 'Nikolsk Ussurijsk, ab. *xanthopygata* Schaw. Type 3' (UM, Bremen), here designated [examined].

♂ (Fig. 127). 22–41 mm. Pale ochreous white. Length of labial palpus approximately 1·2 times diameter of compound eye. Forewing pale ochreous white, underside fuscous; hindwing pale ochreous white, underside suffused with fuscous in costal half.

♀ (Fig. 128). 23–47 mm. White. Fore- and hindwing white on both surfaces, sometimes upperside of forewing suffused with very pale ochreous white; frenulum double-bristled. Anal tuft pale ochreous yellow.

GENITALIA ♂ (Figs 31, 32). Subteguminal process large, flattened, with sinuous margin; aedeagus slightly swollen in apical third, vesica with minute spines, one slender and two stout cornuti present, larger one usually with a more or less distinctly bifid tip.

GENITALIA ♀ (Fig. 96). Ostium bursae broad, membranous; ductus bursae long and narrow, antrum present.

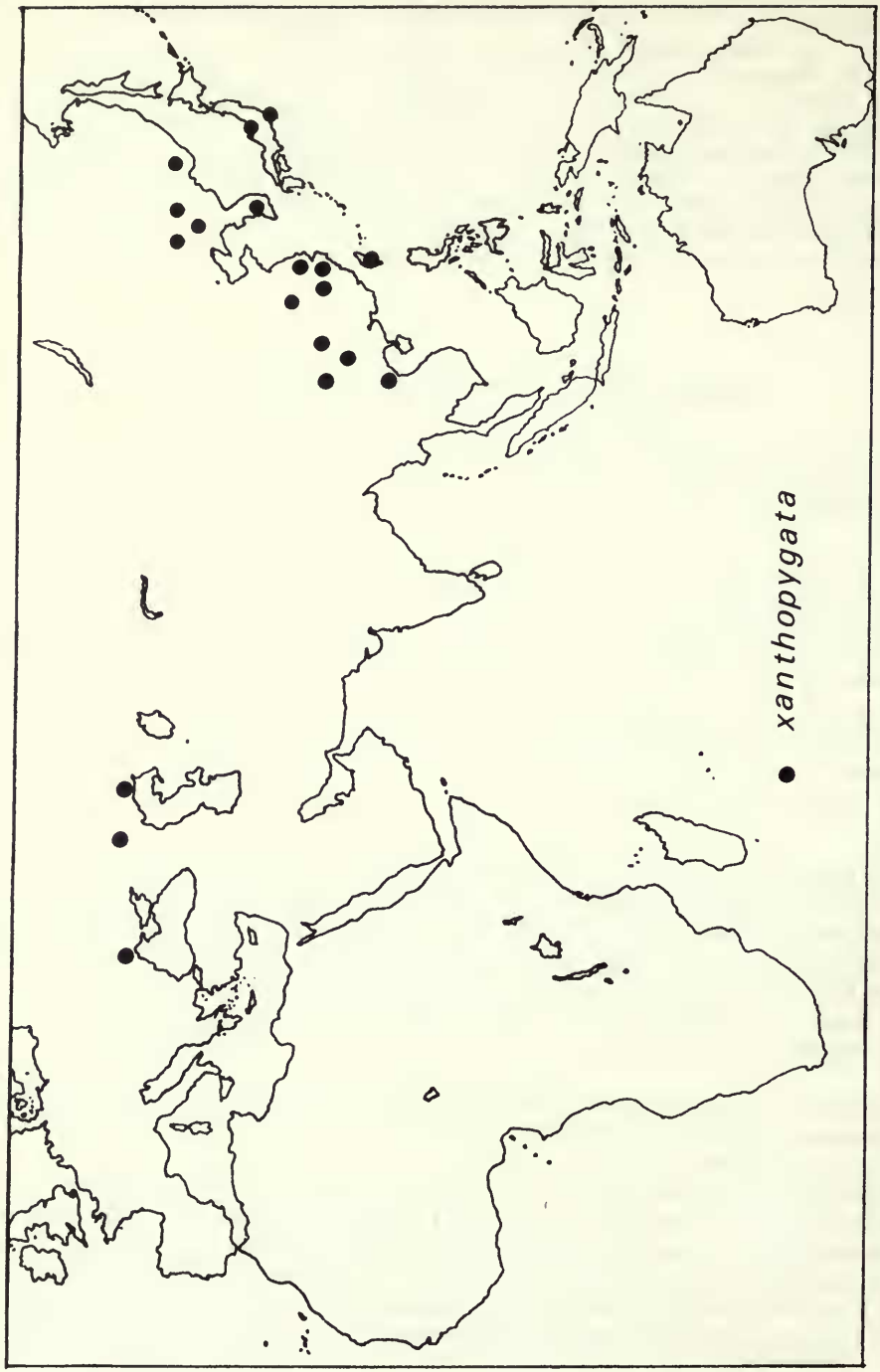
REMARKS. In general the male of *S. xanthopygata* is smaller than that of *S. praelata,* but males from the U.S.S.R are about the same size. It appears from the material examined that specimens of *S. xanthopygata* from the U.S.S.R. have in the past been misidentified as *S. praelata,* probably because of their similarity in size. By external morphology the male of *S. xanthopygata* can be distinguished from *S. praelata* by the shorter antennal cilia, which are about three-quarters of the diameter of the antennal shaft, while in *S. praelata* they are about 1·2 times its diameter. In the female of *S. xanthopygata* the anal tuft is pale ochreous yellow, while in *S. praelata* it is greyish white.

In the genitalia of the male of *S. xanthopygata* the bases of the cornuti are long, but short and stout in *S. praelata*. In the female, the ductus bursae is long and narrow in *S. xanthopygata* while in *S. praelata* it is comparatively short and broad.

The male genitalia of this species are very similar to those of *S. nivella* in which the bases of the cornuti are long, but in *S. xanthopygata* the larger one usually has a bifid tip and the vesica is lined with spines which are smaller than those in *S. nivella*. The males of *S. xanthopygata* and *S. nivella* are usually quite distinct superficially, and the latter species has markings on the forewing although in a very few specimens the markings are absent, leaving a plain ochreous forewing. In this case the two characters in the genitalia mentioned above are useful for separating these two species.

In the female genitalia, the long ductus bursae and the shape of the antrum are very characteristic of *S. xanthopygata*.

BIOLOGY. Unknown.



Map 2

DISTRIBUTION. U.S.S.R., China, Vietnam, Taiwan, Japan, Korea.

MATERIAL EXAMINED

U.S.S.R.: 1 ♀, same data as lectotype (UM, Bremen); 1 ♀, Nikolsk Ussurijsk, 21.vii.1919 (UM, Bremen); 1 ♀, Nikolsk Ussurijsk, 21,vii1919 (LN, Karlsruhe); 1 ♀, Nikolsk Ussurijsk, 30.vii[19] 19 (ZSBS, Munich) (all paralectotypes of *Scirpophaga praelata* v. *xanthopygata* Schawerda); 1 ♀, Ural, 1872 (*Haberh*[*auer*]) (NM, Vienna); 1 ♂, Sarepta (MAK, Bonn); 1 ♀, Sarepta (BMNH); 1 ♀, Ussuri Railway, Chabarovsk, 22.vii.1910 (*Barsow*) (BMNH); 1 ♂, Ukraine, 14.viii.1941 (MAK, Bonn); 1 ♂, South U.S.S.R. (BMNH); 1 ♀, no further data (NM, Vienna). **China**: 2 ♀, Harbin, 30.vii.1937 (BMNH); 1 ♀, Harbin, vii.1923 (*Tolmachov*) (MAK, Bonn); 1 ♀, Hsiolin, Manchuria, 7.vii.1937 (BMNH); 1 ♀, Djalantun, Manchuria, 23.vii.1937 (*Khingan*) (BMNH); 1 ♀, Manchuria (BMNH); 1 ♀, Sidemi (*Jankowski*) (BMNH); 1 ♂, Shanghai, ix.1892 (BMNH); 4 ♂, 6 ♀, Shanghai (MNHN, Paris); 1 ♀, Shanghai, 21.ix.1935 (MAK, Bonn); 9 ♂, 3 ♀, Hsü-Chin-Hui (Zi Kaweg) (MNHN, Paris); 1 ♂, 1 ♀, Fokien, Tinghai, vi.1899 (*Garde*) (BMNH); 2 ♂, 1 ♀, Lui Shin Tze, Hupeh Prov., viii.1912 (*Betton*) (BMNH);1 ♂, 1 ♀, Ichang, viii.1887 (*Pratt*) (BMNH); 4 ♀, Chungking, 7.viii.–11.x.1912 (*Barry*) (BMNH); 1 ♀, Shantung, Tsinan, 6.ix.1926 (*Hindle*) (BMNH); 1 ♀, Chekiang (BMNH); 1 ♀, Tien-mu-shan, Chekiang Prov., 8.vi.1932 (*Höne*) (BMNH); 1 ♀, Tapaishan, 8.viii.1936 (*Höne*) (MAK, Bonn); 1 ♂, 1 ♀, Lungtan nr Nanking, 26.vi., 27.vii.1933 (*Höne*) (LN, Karlsruhe); 5 ♂, 8 ♀, 31.v.–7.x.1933 (*Höne*) (MAK, Bonn); 2 ♂, 1 ♀, Foochow (*Yang*) (BMNH); 2 ♀, Peiping (BMNH); 1 ♂, 5 ♀, no further data (BMNH). **Vietnam**: 1 ♂, 2 ♀, Tongking, Phu-tho (MNHN, Paris); 1 ♀, Tongking, Cho-Ganh (MNHN, Paris). **Taiwan**: 1 ♀, Takow, 18.ix.1904 (*Wileman*) (BMNH). **Japan**: 2 ♀, Kashiwagi, prov. Yamato, Honshu, 26.vi.1899 (*Wileman*) (BMNH); 1 ♀, Yoshino, prov. Yamato, Honshu, 11.vii.1899 (BMNH); 1 ♂, Yokohama, 18.viii.1911 (*Höne*) (LN, Karlsruhe); 3 ♂, 5 ♀, Yokohama, 9.x.1910, 17–22.ix.1911 (*Höne*) (MAK, Bonn). **Korea**: 1 ♀, Ryong Hpieng, 1.ix.1936 (MNHN, Paris).

Scirpophaga nivella (Fabricius, 1794)
(Figs 33, 34, 97, 98, 129, 130, Map 3)

Tinea nivella Fabricius, 1794: 296; Zimsen, 1964: 577. Holotype ♀, INDIA: '*C. niveus*, ex. Ind. Or.'; 'Mus. Sch. & T. L.' (ZM, Copenhagen, genitalia slide no. 3602) [examined].

Crambus niveus (Fabricius) Fabricius, 1798: 472; Zimsen, 1964: 577.

Scirpophaga chrysorrhoa Zeller, 1863: 1; Hampson, 1895: 913; 1896: 46 (partim); Leech, 1901: 401 (partim); Martin, 1958: 189, figs 4, 8, pl. 6, figs 5, 6; Common, 1960: 314, figs 4A, 4B, 7B, pl. 1, figs 1, 2. Holotype ♀, JAVA: 'Java, Tengstr. 98'; 'Zell. Coll. 1884' (BMNH, Pyralidae genitalia slide no. 2263) [examined]. **Syn. n.**

Scirpophaga auriflua Zeller, 1863: 2; Moore, 1867: 666; 1886: 387; Hampson, 1895: 913; 1896: 46 (partim). Holotype ♀, INDIA: 'Calcutta, Staint. 3/56, Zell. Coll. 1884' (BMNH, Pyralidae genitalia slide no. 6317) [examined]. [Synonymized with *nivella* Fabricius by Caradja, 1925: 44, but erroneously cited as a senior synonym.]

Scirpophaga brunnescens Moore, 1888: 225. LECTOTYPE ♂, INDIA: Calcutta (*Atkinson*), Moore Coll. 94-106 (BMNH, Pyralidae genitalia slide no. 2466), here designated [examined]. **Syn. n.**

[*Scirpophaga butyrota* Meyrick sensu Meyrick, 1889: 520 (partim, erroneously included in type-series of *Scirpophaga butyrota*). Misidentification.]

Schoenobius celidias Meyrick, 1894: 475; Hampson, 1895: 916 (as a synonym of *Schoenobius adjurellus* Walker). LECTOTYPE ♂, BORNEO: 'S.E. Borneo, Doherty, May 91, 96-43' (BMNH, Pyralidae genitalia slide no. 2264), here designated [examined]. **Syn. n.**

Schoenobius brunnescens (Moore) Hampson, 1895: 916; 1896: 48 (as a synonym of *Schoenobius adjurellus* Walker); Caradja, 1925: 45, pl. 1, fig. 4; Shibuya, 1928: 16, 61; de Joannis, 1929: 609.

Crambus nivella (Fabricius); Aurivillius, 1898: 169.

Apurima nivella (Fabricius) Aurivillius, 1898: 173.

Scirpophaga euclastalis Strand, 1918: 262. Holotype ♂, TAIWAN ('Formosa'): Anping, v.1911 (*H. Sauter*) (IP, Eberswalde) [examined]. **Syn. n.**

Scirpophaga nivella (Fabricius) Shibuya, 1928: 61, pl. 4, fig. 27 (partim); de Joannis, 1929: 607.

♂ (Fig. 129). 21–31 mm. Ochreous. Length of labial palpus approximately 1·3 times diameter of compound eye. Forewing ochreous with four fuscous spots, three on submedian fold at about one-fifth, half and three-quarters, the fourth at lower angle of cell; an oblique irregular fuscous line extends inwards from costa near apex to third spot on fold; a series of small fuscous neural dots along termen, underside fuscous; hindwing whitish, costal area and basal half ochreous, underside ochreous in basal half.

♀ (Fig. 130). 24–40 mm. White. Fore- and hindwing white, sometimes upperside of forewing suffused with pale ochreous; frenulum double-bristled. Anal tuft ochreous yellow.

GENITALIA ♂ (Figs 33, 34). Subteguminal process large, flattened, with sinuous margin; valva rather elongate, apex more or less pointed posteriorly; aedeagus slightly swollen in apical fourth; vesica with coarse spines, one slender and two unequal long-based cornuti present.

GENITALIA ♀ (Figs 97, 98). Ostium bursae broad, membranous, wrinkled, lined with minute spines. Ductus bursae with two forms of sclerotization. In females from the Asiatic mainland south to Sumatra, the plates in the antrum are separated, and the sclerotization between the ductus seminalis and corpus bursae is usually annulated laterally and broader in diameter than the section between the ductus seminalis and ostium bursae (Fig. 97). In females from Timor to Fiji, with the exception of one specimen from Oomsis, Markham Valley, New Guinea, the plates of the antrum are fused to form a single more or less hemispherical structure, and the ductus bursae has the sclerotization smooth, non-annulated and nearly uniform in diameter (Fig. 98).

REMARKS. Moore did not mention the number of specimens in the type-series of *Schoenobius brunnescens*, but stated that they were in the collections of Staudinger and Moore. Only one syntype, here designated as lectotype, can at present be found; paralectotype material is possibly located in Staudinger's collection in Berlin.

In the male of *S. nivella,* the markings on the forewing can be variable. The three spots on the submedian fold are sometimes obsolescent but the fourth spot at the lower angle of the cell is usually prominent. In a few specimens, the markings are entirely absent, and the wing is plain ochreous. In the female the forewing is usually white, but it is sometimes suffused with pale ochreous. Cervix bursae is present in some female genitalia.

Female specimens from the Asiatic mainland, Sri Lanka, Andaman Islands, Sumatra, Borneo, Sarawak, Philippines and Taiwan, have genitalia with separate sclerotized plates in the antrum. The section of the ductus bursae between the ductus seminalis and the corpus bursae is dilated and usually wrinkled laterally (Fig. 97). On the other hand, the females from Timor, Aru Island, New Guinea (except one female from Oomsis, Markham Valley), Australia and Fiji differ in having a fused structure (Fig. 98). No difference could be found between male specimens from these two regions.

The name *S. nivella* has, until now, been erroneously used for *S. excerptalis,* and this species was known as *S. chrysorrhoa*. In superficial appearance, the male of *S. nivella* is very similar to that of *S. incertulas* in markings, but *S. nivella* can be distinguished by its shorter maxillary and labial palpi. The length of the labial palpus is about 1·3 and 3·0 times the diameter of the compound eye in *S. nivella* and *S. incertulas* respectively. The forewing of *S. incertulas* is rather dull while in *S. nivella* it is more shining.

In the male of *S. nivella*, the coarse spines on the vesica and the long-based cornuti are characteristic, while in the female the shape of the antrum is diagnostic.

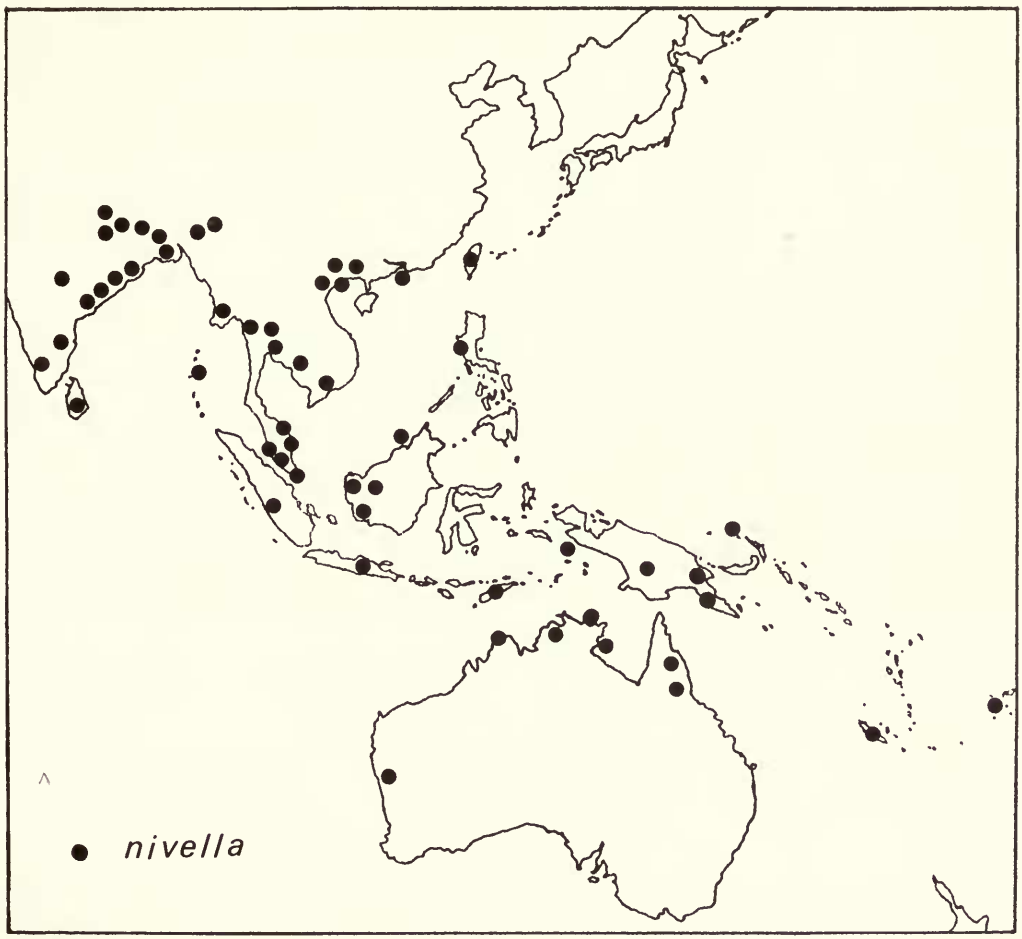
BIOLOGY (for host plants see p. 192). Many authors incorrectly referred to *Scirpophaga nivella* as a serious pest of sugar-cane. Such observations are based on misidentifications, since *S. nivella* is associated mainly with rice. The pest of sugar-cane which has the common name 'top borer' is likely to be *S. excerptalis*.

The true *S. nivella*, which was until now recorded as *S. chrysorrhoa,* is found mainly in rice fields. The males of this species have the colour and markings of the forewing very similar to those of the males of *S. incertulas,* which is a very serious pest of rice. There is no doubt that males of *S. nivella* have been misidentified as *S. incertulas* in many of the numerous publications citing the latter.

The host plants and parasites mentioned in the literature need to be checked critically. Marumo (1934) listed *Saccharum officinarum* and *Miscanthus sinensis* as the host plants of *S. nivella*. Moritsugu (1931) stated that in Taiwan, in addition to sugar-cane, the larva of *S. nivella* also feeds on *Miscanthus sinensis, Imperata cylindrica, Phragmites longivalvis, Ischaemum rugosum* and *Typha capensis*. From this list, the species that feeds on sugar-cane should be *S. excerptalis*. It is not certain whether there were any true *S. nivella*, and probably several species were involved. He also stated that the adults were not attracted to light. This is not true of *S.*

nivella and *S. excerptalis* because, in the material examined, there are specimens of both species which were caught at light. *S. nivella* recorded by Jepson (1954: 9, 20) is likely to be *S. excerptalis*.

There are many references to the life history but it is impossible to determine in most cases if they refer to the true *S. nivella*. Undoubtedly the majority of them should be ascribed to *S. excerptalis*.



Map 3

DISTRIBUTION. India, Nepal, Bangladesh, Sri Lanka, Andaman Islands, Burma, Thailand, Vietnam, China, Hong Kong, Taiwan, West Malaysia, Singapore, Philippines, Sumatra, Java, Borneo, Timor, Aru Island, New Guinea, Australia, New Caledonia, Fiji.

MATERIAL EXAMINED

India: 7 ♂, Calcutta, 1858 (*Atkinson*) (BMNH); 4 ♂, Calcutta (MNHN, Paris); 3 ♂, 1 ♀, Calcutta, 5.vii.–27.x.1934, x.1890 (BMNH); 2 ♀, Calcutta (BMNH); 1 ♂, 1 ♀, Barrackpur (BMNH); 1 ♂, Barrackpur (MNHN, Paris); 1 ♂, 1 ♀, Barrackpur, 9.i.1886 (UM, Oxford); 1 ♀, Bihar, 11.viii.1915 (*Boyd*) (BMNH); 1 ♀, Bihar, at light, 17.x.1933 (*Batra*) (BMNH); 4 ♀, Godavari Dist., Samalkot, at light, xii.1925 (BMNH); 2 ♀, Bhubaneswar, at rest on *Cyperus* sp. (BMNH); 2 ♀, Bhubaneswar, at rest on *Oryza sativa*, 18, 28.iv.1962 (NMNH, Washington); 1 ♀, Bhubaneswar, on *Scirpus* sp., xi.1963 (BMNH); 1 ♂, Orissa (BMNH); 1 ♂, 1 ♀, Munghal Sarai, 6–12.iv.1904 (*Betton*) (BMNH); 1 ♂, 2 ♀, Lucknow, 400 ft [120 m], at light, 8.xi.1937, 1–14.viii.1938 (*Graham*) (BMNH); 1 ♀, Cochin, 27.xii.1941 (*Graham*) (BMNH); 1 ♀, Ganjam (*Elwes*) (BMNH); 2 ♀, Assam, at rest on *Scirpus* sp., iii.1963 (BMNH); 1 ♂, Assam (BMNH); 1 ♀, Madras, vii.1897

(BMNH); 1 ♀, Jorhat, in rice-field, viii.1962 (BMNH); 1 ♂, no further data (UM, Oxford); 6 ♀, no further data (BMNH). **Nepal**: 15 ♂, 9 ♀, Rapti Tal, Megouli, 300 m, 29.iii.–4.iv.1962 (*Ebert & Falkner*) (ZSBS, Munich); 1 ♀, Rapti Tal, Jhawani, 200 m, 15.v.1967 (*Dierl-Forster-Schacht*) (ZSBS, Munich); 1 ♀, Katmandu, 1400 m, 9.vi.1962 (*Ebert & Falkner*) (ZSBS, Munich); 1 ♂, Bhimpedi, 400 m, 4–7.iv.1962 (*Ebert & Falkner*) (ZSBS, Munich). **Bangladesh**: 1 ♂, Dacca, on *Oryza sativa,* 1964 (BMNH); 1 ♂, Bengal, 27.vii.1911 (*Fletcher*) (BMNH). **Sri Lanka**: 1 ♂, Galgamma, x.1907 (BMNH); 3 ♂, 7 ♀, Colombo, 14.iv.1898, x.1901, vii.1907, viii.1908, ix.1911 (BMNH); 1 ♀, Bodurelia (*Penther*) (NM, Vienna); 4 ♂, Hambantota (BMNH); 1 ♀, Mirigama (BMNH); 4 ♂, Puttalam (BMNH); 1 ♂, Tricomali, 10.i.1908 (*Meade Waldo*) (BMNH); 1 ♀, iii.1891 (BMNH); 1 ♂, 2 ♀, no further data (BMNH). **Andaman Islands**: 2 ♀, Port Blair, xii.1904–i.1905 (BMNH); 1 ♂, Port Blair, 18.iii.1925 (*Mujtaba*) (BMNH); 3 ♂, 20 ♀, no precise locality, i.1904 (BMNH). **Burma**: 1 ♀, Mergui (BMNH); 1 ♀, Kadan Kyun (King Island) (*Bott*) (BMNH); 2 ♂, Rangoon, vii.–viii.1889 (BMNH); 1 ♂, 4 ♀, Rangoon (BMNH); 1 ♂, 1 ♀, Lower Burma (BMNH). **Thailand**: 2 ♂, 2 ♀, Bangkok, in rice-fields, 25.xii.1967, 23.i.–6.iii.1968 (*Hattori*) (DA, Bangkok); 1 ♀, Bangkok (*Aagaard*) (BMNH); 1 ♀, Bangkok, at light, 22.vi.1951 (*Vorasap*) (DA, Bangkok); 3 ♀, 18.viii.–3.ix.1924 (BMNH); 4 ♀, 1–31.v.1926 (*Ladell*) (BMNH); 1 ♀, Bangkok, 1.iii.1954 (*Munyeekul*) (DA, Bangkok); 1 ♂, 1 ♀, Bangkok, 1.xi.1948 (*Pholboon*) (DA, Bangkok); 2 ♀, Bangkok, 5.viii.1963, 24.ix.1970 (DA, Bangkok); 1 ♀, Bangkok, 20.ix.1965 (*Bänzinger*) (BMNH); 1 ♀, Bangkok (*Smith*) (NMNH, Washington); 5 ♀, Rangsit, 2.vi.–6.xi.1926 (DA, Bangkok); 1 ♂, Rangsit, xi.1966 (DA, Bangkok); 1 ♂, Prathumthani, at light, 10.ii.1963 (*Paranatee*) (NMNH, Washington); 3 ♀, Cholburi, 20.ix.1954 (*Grohs*) (DA, Bangkok); 2 ♀, Chantaburi, 6–17.xii.1955 (*Pholboon*) (DA, Bangkok); 1 ♂, 3 ♀, Chantaburi, 1–7.ii.1958 (*Arunin*) (DA, Bangkok); 1 ♂, Kanchanaburi, 26.ix.1955 (*Lekakul*) (DA, Bangkok); 3 ♀ Minburi, ix.1935 (*Penchitr*) (DA, Bangkok); 2 ♂, 2 ♀, no further data (BMNH); 4 ♂, 8 ♀, 10.ii.–10.v.1962 (*Friedel*) (ZSBS, Munich). **Vietnam**: 4 ♂, 6 ♀, Tongking, Choganh (MNHN, Paris); 3 ♀, Hanoi (MNHN, Paris); 1 ♀, Hanoi, iv.–vi.1904 (MNHN, Paris); 1 ♀, Haiphong (BMNH); 4 ♀, Saigon (MNHN, Paris); 3 ♀, Cochin China (MNHN, Paris). **China**: 1 ♂, Kwangtung, 6.xi.1934 (*Chiu*) (BMNH). **Hong Kong**: 2 ♂, Lamti, on *Eleocharis* sp., 15.ix.1961 (*So*) (BMNH). **Taiwan**: 11 ♀, Suishako, 1907 (BMNH); 1 ♀, Tainan, 1.iv.1905 (*Wileman*) (BMNH); 8 ♀, Takow, 4.ix.–30.x.1904 (*Wileman*) (BMNH); 2 ♀, Tingan, Hainan, vi.1905 (BMNH). **West Malaysia**: 4 ♀, Penang, xi.1896 (*Curtis*) (BMNH); 4 ♂, Port Dickson, at light, 19.iii.1927, 12.–18.i.1941 (BMNH); 1 ♀, Kelantan, 28.vii.1926 (BMNH); 1 ♀, Bukit Tangga, 28.i.1919 (*Laverock*) (BMNH); 1 ♀, Pahang, at light, 19.vii.1925 (*Evans*) (BMNH); 1 ♀, Selangor, 22.vii.1825 (*Seimund*) (BMNH); 2 ♀, Kuala Lampur, 19.i., 4.iii.1924 (BMNH); 1 ♀, Kuala Lumpur, xii.19--(*Kloss*) (BMNH); 2 ♀, Butterworth, 19.xii.1969 (BMNH); 1 ♀, Malacca, 18.ii.1903 (*Meade Waldo*) (BMNH). **Singapore**: 1 ♂, 7 ♀, no further data (*Ridley*) (BMNH); 1 ♀, ii.–iv.1906 (*Ridley*) (UM, Oxford). **Philippines**: 3 ♂, 32 ♀, 7.i., 9.iii., 8.xi., 24.xii.1913 (*Wileman*) (BMNH); 1 ♀, Manila (MNHN, Paris); 1 ♂, 1 ♀, Tarlic (*Browne*) (BMNH). **Sumatra**: 1 ♀, Padang (BMNH). **Borneo**: 1 ♂, 'S.E. Borneo, WD. 5/91' (BMNH) (paralectotype of *Schoenobius celidias* Meyrick); 17 ♀, Sarawak, Paya Paloh, at light, 3.iv.–17.v., 13.xii.1967 (*Rothschild*) (BMNH); 7 ♀, Sarawak, on *Oryza sativa,* 18.iii.1966 (*Rothschild*) (BMNH); 1 ♀, Sarawak, Simanggang, 13.x.1962 (*Wallace*) (BMNH); 2 ♀, Sarawak, Pruan, 12.x.1962 (*Wallace*) (BMNH); 4 ♂, 8 ♀, Sarawak (BMNH); 1 ♂, Kuching (UM, Oxford); 1 ♀, Kretam, 21.xi.1950–i.1951 (*Hedley*) (BMNH); 1 ♀, Labaun, xi.1911 (*Everett*) (BMNH). **Timor**: 9 ♂, Suai, 7–31.xii.1912, 15–21.i.1913 (*Wahr*) (BMNH). **Aru Island**: 1 ♀, iv.–vii.1896 (*Webster*) (BMNH). **New Guinea**: 1 ♂, Port Moresby, 28.i.1913 (*Garson*) (UM, Oxford); 1 ♀, Port Moresby, 1888 (BMNH) (paralectotype of *Scirpophaga butyrota* Meyrick); 1 ♀, Port Moresby (BMNH); 2 ♀, St Joseph River (*Weiske*) (BMNH); 1 ♂, St Matthias I., vii.1923 (*Eichhorn*) (BMNH); 1 ♀, Oomsis, Markham Valley, 100 ft [30 m], 31.viii.1957 (*Munroe & Holland*) (BMNH); 7 ♂, 1 ♀, Digoel R. (*Vertenten*) (ZM, Amsterdam). **Australia**: 1 ♂, 2 ♀, Port Darwin, 6.vi.–2.vii.1922 (*Wilson*) (BMNH); 3 ♀, Port Darwin, vi.1890, vii.1891 (BMNH); 1 ♂, Port Darwin, 1910 (*Dodd*) (BMNH); 1 ♂, 1 ♀, Port Darwin (BMNH); 1 ♂, Cassini I., v.1891 (BMNH); 1 ♀, Groote Eylandt I., 26.i.1925 (*Wilkins*) (BMNH); 1 ♀, Crocodile I., 26.xii.1925 (*Wilkins*) (BMNH); 1 ♂, 1 ♀, Mackay, Queensland (BMNH); 1 ♂, Cooktown, Queensland (BMNH); 1 ♂, Geraldton, Queensland (BMNH); 1 ♀, Queensland (BMNH). **New Caledonia**: 1 ♀, 1939 (MNHN, Paris). **Fiji**: 1 ♂, Vunidawa, 14.ii.1933 (BMNH); 1 ♀, Koronivia, at light, 26.x.1962 (BMNH); 5 ♀, ix.1966,1967 (*Robinson*) (BMNH); 1 ♀, no further data (NMNH, Washington).

Scirpophaga parvalis (Wileman, 1911)
(Figs 37, 38, 99, 131, 132, Map 4)

Schoenobius costalis var. *parvalis* Wileman, 1911: 355. Holotype ♂, JAPAN: Yokohama, prov. Musashi, Honshu Plains, 12.viii.1898 (*A. E. Wileman*) (BMNH, Pyralidae genitalia slide no. 6343) [examined].
[*Scirpophaga auriflua* Zeller sensu Leech, 1901: 401 (partim). Misidentification.]
Scirpophaga parvalis (Wileman) Shibuya, 1931: 368; Marumo, 1934: 2, 15, pl. 1, figs 4, 5.

♂ (Fig. 131). 20–25 mm. Pale ochreous white. Length of labial palpus approximately 1·2 times diameter of compound eye. Forewing pale ochreous white, underside fuscous; hindwing pale ochreous white, underside suffused with fuscous in costal half.

♀ (Fig. 132). 25–31 mm. White. Fore- and hindwing white on both surfaces; frenulum double-bristled. Anal tuft white.

GENITALIA ♂ (Figs 37, 38). Subteguminal process large, flattened, rounded, with smooth margin; valva nearly truncate; aedeagus swollen in apical third, vesica with minute spines, one slender and three stout cornuti present.

GENITALIA ♀ (Fig. 99). Ostium bursae broad, membranous, wrinkled; ductus bursae broad, section between ostium bursae and ductus seminalis expanded, slightly evaginated medially, and that between ductus seminalis and corpus bursae more or less uniform in diameter.

REMARKS. The male of *S. parvalis* is similar externally to that of *S. xanthopygata* in general coloration and size, and the two may be confused since they are overlapping in their distribution (Manchurian Subregion). In general, the frons of *S. parvalis* is more convex than that of *S. xanthopygata,* but as there is a certain amount of variation, it can be almost identical. The ventral cilia of the antenna in *S. parvalis* are about the same in length as the diameter of the antennal shaft, while in *S. xanthopygata* they are only about three-quarters of the diameter. This seems at present to be the most useful character separating these two species externally.

S. parvalis can be distinguished from the other white species by the genitalic structures. In the male, the subteguminal process is rounded and there are four cornuti in the aedeagus. In the female, the ductus bursae is broad and heavily sclerotized, and thus cannot be confused with that of the other species.

BIOLOGY. Unknown.

DISTRIBUTION. Japan, North Korea, South Korea, China.

MATERIAL EXAMINED

Japan: 2 ♀, same data as holotype (BMNH), 4 ♂, same data as holotype, 3.viii.1898 (BMNH), 1 ♀, same data as holotype, 10.viii.1898 (BMNH), 1 ♀, Tokyo, Musashi, Honshu Plain, 10.ix.1893 (all paratypes of *Schoenobius costalis* var. *parvalis* Wileman) (BMNH); 1 ♀, Kobe, vi.1913 (*Höne*) (MAK, Bonn); 1 ♂, Kyushu, 8.vi.1958 (*Yoshii*) (CNC, Ottawa); 1 ♀, Nikko, prov. Shimotsuke, Honshu, 2000 ft. [600 m], 5.viii.1893 (*Wileman*) (BMNH); 1 ♀, Sakata, viii.1896 (*Leech*) (BMNH); 25 ♂, 24 ♀, Yokohama, 27.viii.1910–28.vii.1912 (*Höne*) (MAK, Bonn); 14 ♂, 5♀, Yokohama, 27.vi.1910–viii.1912 (*Höne*) (LN, Karlsruhe); 1 ♀, no further data (BMNH). **Korea (North)**: 1 ♀, Wonsan (Gensan), 9.vii.1897 (*Fletcher*) (BMNH); 2 ♀, Oridong, 1–7.x.1953 (*Thompson*) (BMNH). **Korea (South)**: 1 ♂, 3 ♀, Inchon (Chemulpho), 5–21.viii., 10.ix.1944 (*Howarth*) (BMNH). **China**: 2 ♀, Harbin, 6–29.vii.1952 (*Alin*) (BMNH); 1 ♀, Hsiaoling, 16.viii.1939 (ZSBS, Munich); 12 ♂, 3 ♀, Foochow, 1936–38 (*Yang*) (BMNH); 1 ♀, Peiping (BMNH); 1 ♀, Shanghai (BMNH); 1 ♀, Shanghai (MNHN, Paris); 1 ♀, Hsü-Chia-Hui (Zi Kaweg) (MNHN, Paris).

Scirpophaga phaedima Common, 1960
(Figs 35, 36, 133, Map 4)

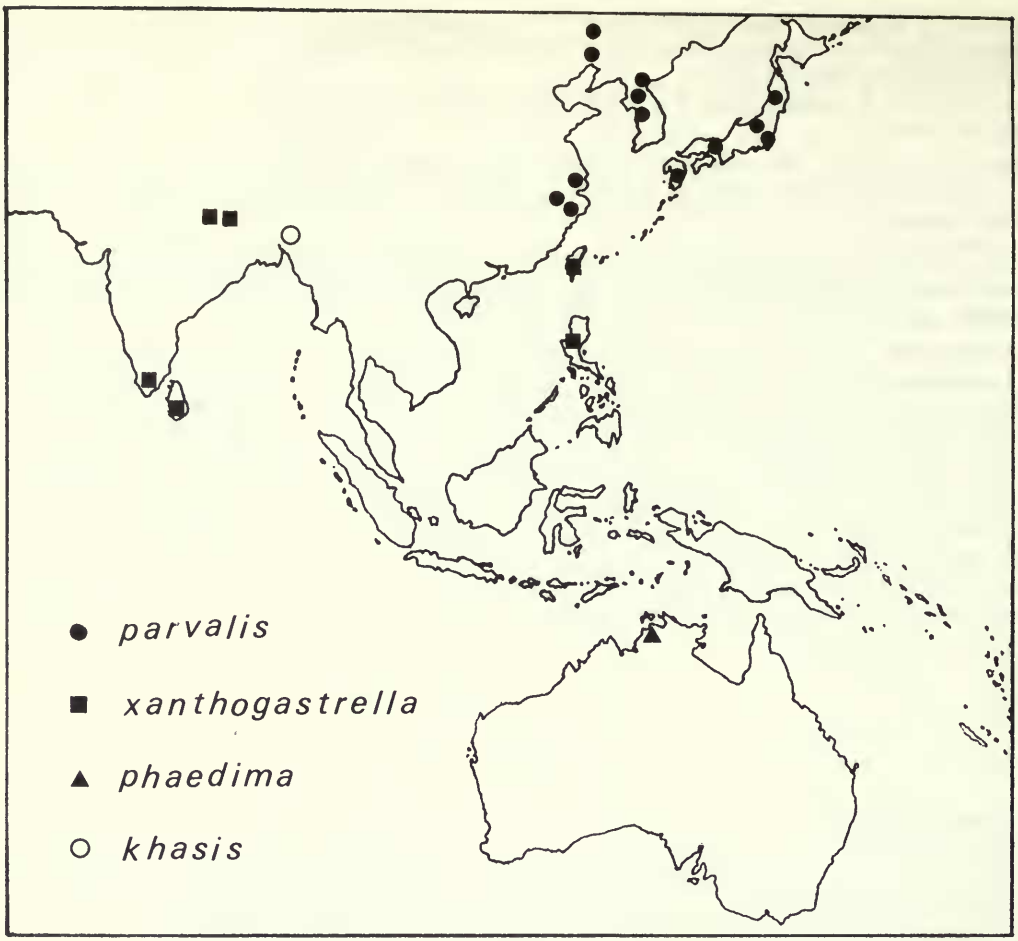
Scirpophaga phaedima Common, 1960: 317, Figs 4C, 4D, pl. 2, Fig. 1. Holotype ♂, AUSTRALIA: P. Darwin, Jan. [19]09 (*F. P. Dodd*) (ANIC, Canberra, genitalia slide no. P15) [examined].

♂ (Fig. 133). 22·4 mm. White. Length of labial palpus approximately 1·6 times diameter of compound eye. Fore- and hindwing white, underside pale fuscous.

♀. Unknown.

GENITALIA ♂ (Figs 35, 36). Uncus and gnathos relatively short; subteguminal process large, flattened, with sinuous margin; valva pointed posteriorly; aedeagus slender, expanded towards apex, vesica with coarse spines, one slender and two stout cornuti present.

REMARKS. Only the male holotype has been examined during the present study. Common (1960) mentions two other male specimens from Silver Plains, Cape York Peninsula, Australia.



Map 4

The male genitalia of this species are very similar to those of *S. nivella* but the uncus and gnathos are relatively shorter and the dorsal sclerotized thickening of the tegumen is square. The uniformly white forewing and smaller size of *S. phaedima* readily distinguish this species from *S. nivella,* which has the forewing ochreous and with markings.

BIOLOGY. Unknown.

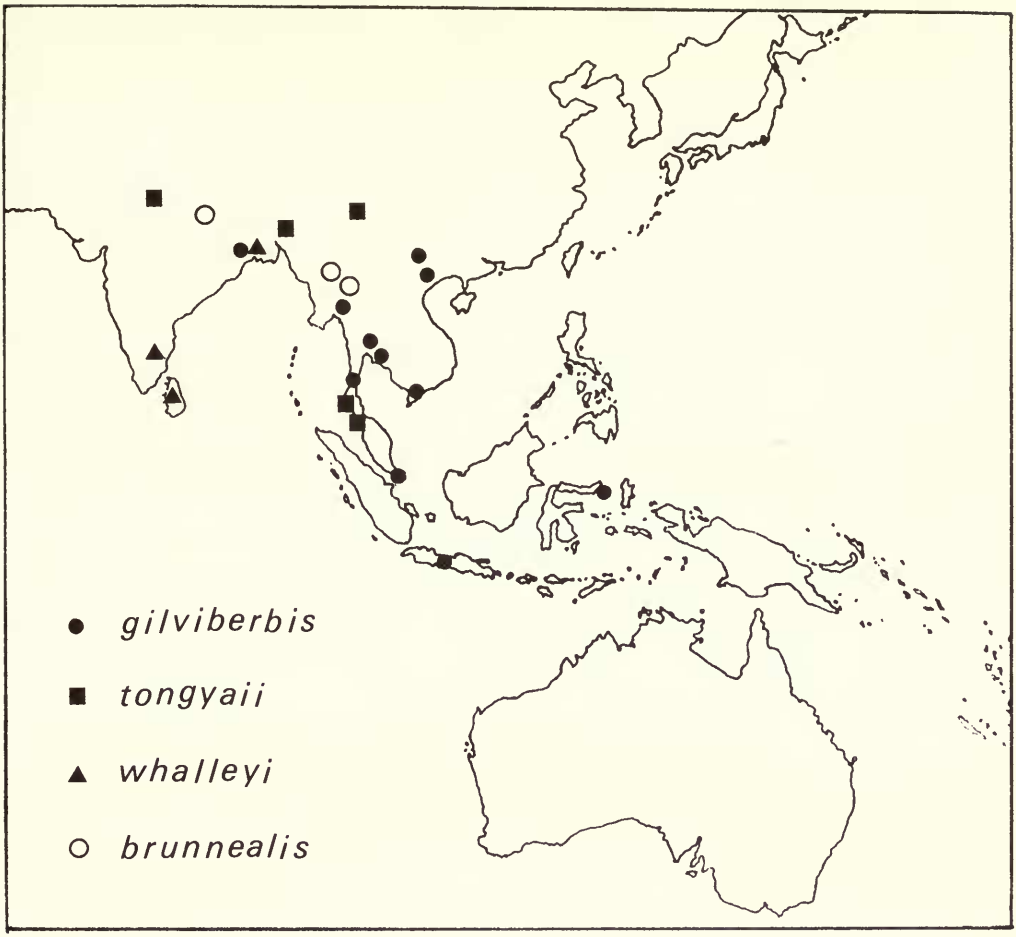
DISTRIBUTION. Australia.

Scirpophaga gilviberbis Zeller, 1863 **comb. rev.**
(Figs 41, 42, 101, 134, 135, Map 5)

Scirpophaga gilviberbis Zeller, 1863:2; Walker, 1864:968; Moore, 1867: 666; Hampson, 1895:913; 1896: 46 (partim); de Joannis, 1929: 607. Holotype ♀, INDIA: [Calcutta] (BMNH, Pyralidae genitalia slide no. 5024) [examined].

Niphadoses gilviberbis (Zeller) Common, 1960: 327; Kapur, 1967: 6, 22.

♂ (Fig. 134). 20–22 mm. Dark ochreous. Length of labial palpus approximately 1.5 times diameter of compound eye. Forewing ochreous with sparse fuscous scales, markings as in *S. nivella;* underside fuscous; hindwing white, costal area and apex ochreous.



Map 5

♀ (Fig. 135). 23–35 mm. White. Fore- and hindwing white, sometimes suffused with ochreous; frenulum single-bristled. Anal tuft whitish grey to dark grey.

GENITALIA ♂ (Figs 41, 42). Uncus and gnathos relatively long and slender, gnathos arms converging gradually; subteguminal process flattened, rounded, with smooth margin; valva with costal and ventral margins nearly straight and parallel, distal margin rounded; aedeagus slender, one tridentate and two stout cornuti present.

GENITALIA ♀ (Fig. 101). Ostium bursae broad, membranous; ductus bursae without antrum, section between ostium bursae and ductus seminalis with sclerotized plates U-shaped in cross section; corpus bursae with small spines, denser in basal two-thirds.

REMARKS. This species differs from those of the *praelata*-section in that the female has only a single-bristled frenulum and the ductus bursae is without an antrum. Before this work was undertaken, only the female was known. Common (1960) placed *gilviberbis* in the genus *Niphadoses* which he erected to include four other species, viz. *palleucus, hoplites, elachia* and *chionotus*.

The present study has shown that *gilviberbis* does not belong in *Niphadoses*. In *S. gilviberbis* vein R_1 of the forewing is not anastomosed with *Sc*, and the scales on the labial palpus are smooth and not spreading as in *Niphadoses*. In the female genitalia, the shape of the sclerotized lining of the ductus bursae is similar to that of *Niphadoses* but the ductus seminalis arises from the ductus bursae at the middle and not close to the ostium bursae. Most important is the

presence of the group of setae ventro-laterally on the 8th tergite; this is characteristic of the *praelata*-group. The structure of the male genitalia supports the inclusion of *gilviberbis* in the *praelata*-group.

Much work has been published under the name *gilviberbis*. Whether the specimens referred to are true *gilviberbis* or not remains, in most cases, to be checked. The male is similar externally to *S. nivella* and *S. incertulas,* especially in the markings of the forewings, but the genitalia are quite distinct. In the female of *gilviberbis,* the genitalia are rather similar to those of Australian species which also have only a single-bristled frenulum and the ductus bursae without an antrum. The tapering towards both the ostium bursae and the ductus seminalis of the sclerotized plates in the ductus bursae is characteristic of *gilviberbis.*

Biology. According to the label data of the material examined this species is found mainly in rice fields in Thailand. Fletcher (1917: 174; 1921: 76) and Shroff (1920: 342) reported finding this species commonly in paddy fields in lower Burma.

Distribution. India, Burma, Thailand, Vietnam, Singapore, Java, Sulawesi.

Material examined

India: 1 ♀, Calcutta, 1858 (*Atkinson*) (BMNH); 1 ♀, Barrackpur (BMNH). **Burma**: 1 ♀, Rangoon (BMNH). **Thailand**: 1 ♀, Bangkok, 3.ix.1924 (BMNH); 1 ♀, Bangkok, in rice-fields, 10.ii.1963 (NMNH, Washington); 1 ♀, Bangkok, in rice-field, 23.ii.1969 (*Hattori*) (DA, Bangkok); 1 ♀, Bangkok, at light, 1–31.xii.1968 (*Pholboon*) (DA, Bangkok); 1 ♀, Bangkok, 20.xi.1956 (*Boonprasert*) (DA, Bangkok); 2 ♂, 1 ♀, Bangkok, 8–29.xii.1967 (*Hattori*) (DA, Bangkok); 2 ♂, Rangsit, at light, 27.i.1927 (DA, Bangkok); 2 ♀, Rangsit, 2.vi.1926 (*Ladell*) (BMNH); 1 ♂, 1 ♀, Rangsit, in rice-field, 10.i.1968 (*Hattori*) (DA, Bangkok); 1 ♀, Rangsit, 30.ix.1967 (*Hattori*) (DA, Bangkok); 2 ♀, Cholburi, 20.ix.1954 (*Grohs*) (DA, Bangkok); 1 ♀, Krabi, 1–14.iii.1962 (*Friedel*) (ZSBS, Munich); 1 ♀, no further data (*Ladell*) (BMNH). **Vietnam**: 2 ♀, Hanoi (MNHN, Paris); 1 ♀, Tongking, Choganh (MNHN, Paris); 2 ♂, Cochin China (MNHN, Paris). **Singapore**: 2 ♀, no further data (*Ridley*) (BMNH). **Java**: 1 ♀, no further data (RNH, Leiden). **Sulawesi**: 2 ♀, Soengei Liat., Bangka I. (BMNH).

Scirpophaga percna Common, 1960
(Figs 43, 44, 102, 136, 137, Map 6)

Scirpophaga percna Common, 1960: 325, figs 5E, 5F, 7G, pl. 1, fig. 11. Holotype ♂, Australia: Darwin N.T. (*G. F. Hill*) (ANIC, Canberra, genitalia slide no. P122) [not examined].

♂ (Fig. 136). 22–25 mm. Ochreous. Length of labial palpus approximately 1·6 times diameter of compound eye. Forewing ochreous with dark fuscous markings, underside fuscous; hindwing white with fuscous suffusion in costal half, stronger on underside.

♀ (Fig. 137). 24–37 mm. White. Forewing suffused with pale ochreous, underside white; hindwing white; frenulum single-bristled. Anal tuft ochreous white.

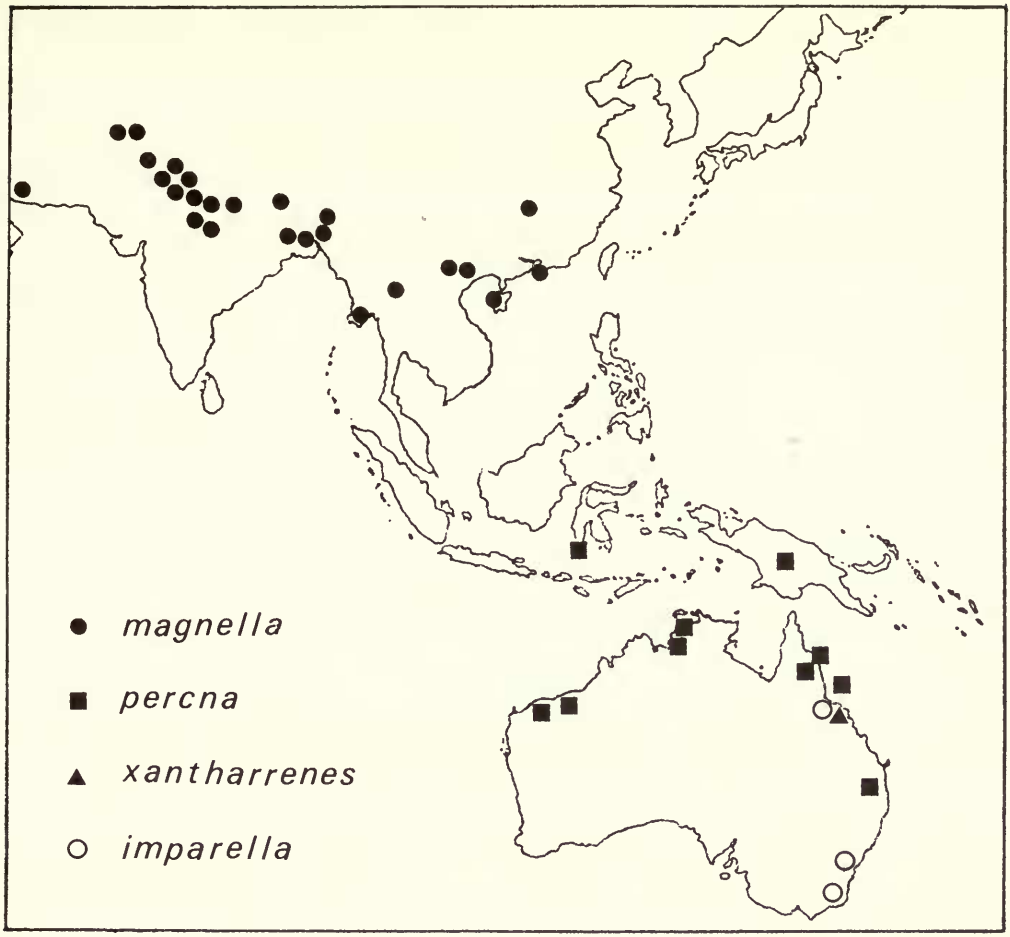
Genitalia ♂ (Figs 43, 44). Uncus and gnathos long, slender, gnathos arms converging gradually; subteguminal process lobe-like with finely serrated margin; valva broad; aedeagus slender, vesica with minute spines, one slender and three stout cornuti present.

Genitalia ♀ (Fig. 102). Ostium bursae broad; ductus bursae without antrum, section between ostium bursae and ductus seminalis lined with sclerotized plates towards ductus seminalis, U-shaped in cross section.

Remarks. The markings on the forewing of the male of *S. percna* are similar to those of *S. imparella,* but the ground colour in *S. percna* is more ochreous. In the male genitalia, the uncus and gnathos are long and the valva is relatively broad. In the female the section of the ductus bursae between the ostium bursae and ductus seminalis is lined with U-shaped sclerotized plates, as in *S. xantharrenes* and *S. imparella,* but the underside of the forewing of *S. percna* is not suffused with fuscous as in the two former species.

Biology. At rest on stems of *Eleocharis dulcis* (Common, 1960).

Distribution. Sulawesi, New Guinea, Australia.



Map 6

MATERIAL EXAMINED

Sulawesi: 1 ♂, Maros (RNH, Leiden). **New Guinea**: 12 ♂, 8 ♀, Digoel River, 1924 (*Vertenten*) (ZM, Amsterdam). **Australia**: 1 ♂, 1 ♀ (paratypes), Humpty Doo, N.T., 2.iv.1959 (*I. F. B. Common*) (BMNH, Pyralidae genitalia slide nos 6315, 6316); 1 ♂, Queensland, 27.iii.1900 (BMNH); 1 ♂, Q., Cooktown (BMNH); 1 ♂, Q., Cedar Bay (*Meek*) (BMNH); 1 ♂, 1 ♀, Q., Salisbury Plains, Boden (*Simson*) (BMNH); 1 ♂, Q., Sherlock River (*Clements*) (BMNH); 1 ♂, Q., Roebourne (BMNH); 1 ♀, Q., Percy I. (BMNH).

Scirpophaga imparella (Meyrick, 1878)
(Figs 45, 46, 103, 138, 139, Map 6)

Schoenobius imparellus Meyrick, 1878: 176; 1885: 437; 1887: 208. Lectotype ♂, AUSTRALIA: 'Sydney, N. S. Wales, 8/3/78' (BMNH, Pyralidae genitalia slide no. 6311), designated by Common (1960: 321) [examined].

Scirpophaga imparella (Meyrick) Hampson, 1895: 914; Common, 1960: 321, figs 5A, 5B, 7E, pl. 1, figs 7, 8.

Scirpophaga helodes Common, 1960: 323, figs 5C, 5D, 7F, pl. 1, figs 9, 10. Holotype ♂, AUSTRALIA: 'Dingo Q., 19 Mar. 1958'; 'at rest on *Eleocharis dulcis*' (*I. F. B. Common*) (ANIC, Canberra, genitalia slide no. P121) [examined]. **Syn. n.**

♂ (Fig. 138). 23–29 mm. Ochreous brown. Length of labial palpus approximately 2·6 times diameter of compound eye. Forewing ochreous brown to dark fuscous, with markings, underside fuscous; hindwing white, underside fuscous.

♀ (Fig. 139). 30–38 mm. White. Forewing white, sometimes with pale ochreous suffusion, underside fuscous; hindwing white; frenulum single-bristled. Anal tuft ochreous white.

GENITALIA ♂ (Figs 45, 46). Gnathos arms converging abruptly; subteguminal process rounded, with very fine serrated margin and scale-like projection on outer surface; aedeagus slender, one slender and three stout cornuti present.

GENITALIA ♀ (Fig. 103). Ostium bursae broad, membranous; ductus bursae without antrum, section between ostium bursae and ductus seminalis lined with sclerotized plate, U-shaped in cross section.

REMARKS. As mentioned by Meyrick (1878), this species is 'extremely variable' in both sexes. In the male, the colour of the forewing varies from ochreous brown to dark fuscous; the markings are also variable and sometimes obsolescent, leaving an almost plain-coloured forewing. Meyrick described the colour of the forewing in the female as 'satiny-white, sometimes more or less strongly suffused throughout with whitish-ochreous'. In the material examined the colour of the forewing in the female varies from pure white to ochreous, and the colour of the anal tuft corresponds with the colour of the forewing.

Common (1960) described a new species, *Scirpophaga helodes*, which is here considered to be conspecific with *S. imparella*. He mentioned that the size of *S. helodes* was usually smaller than that of *S. imparella*. His measurements of the wing expanse of *S. helodes* are: '♂ 20·9–24·2 mm., ♀ 25·8–32·4 mm.' and of *S. imparella*: '♂ 24·2–33·6 mm., ♀ 34·8–48·0 mm.' Common stated that in the male of *S. helodes*, the colour and markings were very variable, as in *S. imparella*, but the females were white and 'appear to be extremely uniform in size and coloration'. From Common's measurements it is obvious that in the female, the largest size of *S. helodes* does not exceed the smallest size of *S. imparella*. In the material examined there are females which have the wing expanse in the same range as *S. helodes*, but instead of being white the forewing is suffused with ochreous as in *S. imparella*. There is no doubt that in the female of this species the size and coloration are very variable.

With regard to the genitalia, Common separated *S. helodes* from *S. imparella* by the following characters: 'the arms of the gnathos [in *S. helodes*] are less abruptly united and the subteguminal processes lack the scale-like surface projection and distinct marginal serrations found in *S. imparella*'. This is true for the holotype and one paratype of *S. helodes* in both of which the subteguminal process appears to have a smooth margin, but under the phase-contrast microscope it is seen to have a serrated margin. In the other paratype, a scale-like surface and serrate margin of the subteguminal process are more obvious than those in the holotype of *S. imparella*. The presence or absence of a scale-like surface and a distinctly serrate margin to the subteguminal process thus appears to be due to individual variation within a single species. No difference could be found in the female genitalia. *S. helodes* was found resting on the stem of *Eleocharis sphacelata*, as also was *S. imparella*. For these reasons *S. helodes* is here considered to be synonymous with *S. imparella*.

BIOLOGY. At rest on *Eleocharis dulcis* (from the label-data of the holotype of *S. helodes*) (Australia). *Juncus prismatocarpus* (Meyrick, 1878; but Common (1960) doubted this host plant); *Heleocharis sphacelata* (Meyrick, 1887); at rest on *Cladium articulatum, Eleocharis sphacelata* (Common, 1960); *Eleocharis dulcis* (Common, 1960, cited under the name *Scirpophaga helodes*).

DISTRIBUTION. Australia.

MATERIAL EXAMINED

Australia: 1 ♂, 3 ♀, New South Wales, Sydney, 8.iii.1878 (BMNH) (paralectotypes of *Schoenobius imparellus* Meyrick); 1 ♂, 2 ♀, Queensland, 12 mls [19 km] E. of Duaringa, 18.iii.1958 (*Common*) (ANIC, Canberra), 1 ♂, Q., Dingo, 19.iii.1958, at rest on *Eleocharis dulcis* (*Common*), 1 ♀, Q., 12 mls [19 km] E. of Duaringa, 4.iv.1957 (*Common*) (allotype and paratypes of *Scirpophaga helodes* Common) (ANIC, Canberra; BMNH); 5 ♀, New South Wales, Nowra, xi.1924 (*Rodway*) (BMNH); 5 ♀, Queensland (BMNH); 4 ♂, 7 ♀, SE. Australia (BMNH); 1 ♀, SE. Australia (MNHN, Paris); 3 ♂, 3 ♀, no locality. 8.iii.1878 (BMNH); 2 ♀, no further data (BMNH).

Scirpophaga xantharrenes Common, 1960
(Figs 47, 48, 104, 140, 141, Map 6)

Scirpophaga xantharrenes Common, 1960: 320, figs 4G, 4H, 7D, pl. 1, figs 3, 4. Holotype ♂, AUSTRALIA: '12 mls [19 km] E. of Duaringa, Q., 18 Mar. 1958' (*I. F. B. Common*) (ANIC, Canberra, genitalia slide no. P124 [not examined].

♂ (Fig. 140). 27–28 mm. Light orange-yellow. Length of labial palpus approximately 1·4 times diameter of compound eye. Forewing light orange-yellow, costa fuscous, underside fuscous; hindwing white, terminal half and underside fuscous.

♀ (Fig. 141). 34 mm. White. Forewing white, costal margin tinged with fuscous, underside fuscous in basal three-quarters, area between costal and subcostal vein white; hindwing white, underside fuscous; frenulum single-bristled. Anal tuft orange-yellow.

GENITALIA ♂ (Figs 47, 48). Uncus and gnathos slender, gnathos arms converging abruptly, subteguminal process large, flattened, with smooth margin; valva short, truncate; aedeagus slender, one slender and two stout cornuti present.

GENITALIA ♀ (Fig. 104). Ostium bursae relatively broad, wrinkled; ductus bursae without antrum, section between ostium bursae and ductus seminalis lined with sclerotized plate, tapering towards ductus seminalis, U-shaped in cross-section.

REMARKS. This species is known only from Australia. The male can be separated from the other Australian species of the group by the light orange-yellow colour of the forewing and the fuscous line along the costa. In the genitalia, the gnathos arms converge abruptly and the valva is relatively short and truncate.

In the female the genitalia are similar to those of *S. percna*, but in *S. xantharrenes* the underside of the forewing is suffused with fuscous, whereas it is white in *S. percna*.

BIOLOGY. At rest on the stem of *Eleocharis dulcis* (Common, 1960).

DISTRIBUTION. Australia.

MATERIAL EXAMINED

Australia: 1 ♂, 1 ♀, Queensland, 12 mls [19 km] E. of Duaringa, 18.iii.1958 (*Common*) (BMNH) (paratypes).

Scirpophaga melanoclista Meyrick, 1935
(Figs 39, 40, 100, 142, 143, Map 12)

Scirpophaga melanoclista Meyrick, 1935: 553. Holotype ♂, ZAIRE: 'Elisabethville' [Lubumbashi], 31.i.1933 (*Ch. Seydel*), (MRAC, Tervuren) [examined].

♂ (Fig. 142). 23–32 mm. Pale ochreous white. Length of labial palpus approximately 1·4 times diameter of compound eye. Forewing pale ochreous white to pale ochreous, costal margin strongly tinged with dark fuscous, underside fuscous; hindwing white, underside fuscous in costal half.

♀ (Fig. 143). 26–37 mm. White. Fore- and hindwing white on both surfaces, frenulum single-bristled. Anal tuft ochreous yellow.

GENITALIA ♂ (Figs 39, 40). Uncus and gnathos relatively long; gnathos arms converging gradually; subteguminal process flattened, oval-shaped with smooth margin; valva truncate; aedeagus slender, more or less uniform diameter throughout, vesica with coarse spines, one slender cornutus present.

GENITALIA ♀ (Fig. 100). Ostium bursae relatively narrow; ductus bursae narrow, tube-like, without antrum, sclerotized plates between ostium bursae and ductus seminalis U-shaped in cross section; groups of setae always present posterior to ostium bursae.

REMARKS. *S. melanoclista* is the only representative of the *praelata*-group known from Africa. The male can be separated from those of the other white species by the presence of the dark fuscous line along the costa. In the genitalia, the large oval-shaped subteguminal process and the solitary slender cornutus are characteristic. In the female the features distinguishing this species are the tube-like ductus bursae which is more or less uniform in diameter and the presence of the two groups of setae posterior to the ostium bursae (Fig. 100).

BIOLOGY. Unknown.

DISTRIBUTION. Senegal, Sierra Leone, Ghana, Zaire, Angola, Zambia, Madagascar.

MATERIAL EXAMINED

Senegal: 1 ♂, 1 ♀, Kaolack, 1909 (*Melou*) (BMNH). **Sierra Leone**: 1 ♂, Pt Lokko (*Penny*) (BMNH). **Ghana**: 1 ♀, Kete-Krachi (*Cardinall*) (BMNH). **Zaire**: 2 ♂, Lubumbashi (Elisabethville), 25.iii.1934, 4.ii.1935 (BMNH). **Angola**: 1 ♂, Daugo, 31.xii.1912 (MNHN, Paris). **Zambia**: 1 ♀, Lealui, Barotse (*Coryndon*) (BMNH); 1 ♂, Matongo I. nr Lake Bangweulu, 23.xi.1946 (BMNH). **Madagascar**: 2 ♂, 4 ♀, Tananarivo (*Waterlot*) (MNHN, Paris); 1 ♀, 22.xii.1927 (*Decary*) (MNHN, Paris); 4 ♂, 16 ♀, Nanisana nr Tananarivo, xii.1931-i.1932 (*Olsovfieff*) (BMNH); 1 ♀, 19.i.1930 (MNHN, Paris); 1 ♀, no further data (MNHN, Paris).

The *excerptalis*-group

Forewing with vein R_1 anastomosing with *Sc*. Frenulum a single bristle in both sexes.

GENITALIA ♂. Uncus and gnathos moderately long and slender, gnathos arms converging gradually; tegumen with sclerotized thickening somewhat ×-shaped; subteguminal process spine-like (except *S. khasis* which is tuberculiform and is absent in *S. flavidorsalis*); manica with two groups of strong spines (except in *S. xanthogastrella* which is uniformly arranged minute spines); aedeagus slender, more or less uniform in diameter, vesica usually lined with coarse spines.

GENITALIA ♀. Ostium bursae broad, membranous, wrinkled, lined internally with minute spines; ductus bursae membranous; ductus seminalis usually arising from ductus bursae closer to ostium bursae than to corpus bursae; corpus bursae with dense spines.

The *excerptalis*-group consists of 10 species. Five are endemic in Asia: *xanthogastrella*, *magnella*, *brunnealis*, *khasis* and *tongyaii*; three are Australasian: *flavidorsalis*, *melanostigma* and *excerptalis*. The last-mentioned is important because it is a very serious pest of sugar-cane; it has the common name 'top borer' and has been misidentified as '*S. nivella*'. The remaining two species of this group occur in Africa: *ochritinctalis* and *bradleyi*.

Although in the male genitalia of *S. tongyaii* the uncus is rather broad, and in *S. khasis* the subteguminal process is tubercle-like and is absent in *S. flavidorsalis*, the other characters correspond to those of this species-group. Only the female of *S. melanostigma* is known; it shows characters typical of this species-group and it is possible that it is the female of *S. flavidorsalis*. This is discussed under *S. melanostigma*.

Key to species of the *excerptalis*-group

Males

The male of *S. melanostigma* is unknown.

1 Subteguminal process absent, if present tubercle-like 2
– Subteguminal process present, spine-like, except plate-like in *S. bradleyi* 3
2 Tegumen with dorsal sclerotized thickening long, ×-shaped (Fig. 61); manica with two bands of sclerotized plates bearing spines at one end; aedeagus uniform in diameter, vesica with coarse spines (Fig. 62) . . . . . ***khasis*** (p. 230)
– Tegumen with dorsal sclerotized thickening broad, ×-shaped (Fig. 63); manica with two groups of spines; aedeagus expanded at apical end, vesica with flat plate-like, serrated-margined cornutus (Fig. 64) . . . . . ***flavidorsalis*** (p. 230)
3 Subteguminal process plate-like; uncus and gnathos relatively short; tegumen large, strongly bent downwards (Fig. 59) . . . . . ***bradleyi*** (p. 229)
– Subteguminal process spine-like; uncus and gnathos relatively long; tegumen not strongly bent downwards. 4
4 Uncus broad; gnathos arms converging abruptly (Fig. 53) . . . . . ***tongyaii*** (p. 232)
– Uncus slender; gnathos arms converging gradually (Fig. 27) 5
5 Forewing dull ochreous brown with one dark fuscous spot; subteguminal process a long curved spine (Fig. 55) . . . . . ***brunnealis*** (p. 228)
– Forewing pale ochreous white with or without spot at lower angle of cell; subteguminal process not as above 6
6 Gnathos wrinkled apically; subteguminal process a large spine (Fig. 49); manica with two bands of sclerotized plates bearing spines at one end (Fig. 50) . . . . ***excerptalis*** (p. 223)
– Gnathos not wrinkled apically; subteguminal process varied; manica with two groups of strong spines or uniformly arranged spines 7

7 Subteguminal process a long, slender, straight spine (Fig. 57) . . . . ***ochritinctalis*** (p. 229)
– Subteguminal process a short, stout spine 8
8 Manica with two groups of strongly sclerotized spines; vesica with coarse spines (Fig. 52) ***magnella*** (p. 226)
– Manica with uniformly arranged spines; vesica with minute spines (Fig. 66) ***xanthogastrella*** (p. 227)

Females

The females of *S. flavidorsalis, S. brunnealis* and *S. khasis* are unknown.

1 African species 2
– Asian or Australian species 3
2 Ostium bursae lined with dense minute spines, especially towards ductus bursae; ductus bursae with section between ostium bursae and ductus seminalis lined with annulated sclerotized plates; apophyses anteriores and apophyses posteriores slender (Fig. 109) . ***ochritinctalis*** (p. 229)
– Ostium bursae lined with few minute spines; ductus bursae with section between ostium bursae and ductus seminalis lined with unannulated sclerotized plates; apophyses anteriores and apophyses posteriores short (Fig. 110) . . . . . ***bradleyi*** (p. 229)
3 Ostium bursae strongly wrinkled, lined with dense spines 4
– Ostium bursae slightly wrinkled, lined with less dense spines 5
4 Ostium bursae strongly wrinkled, forming a compact mass (Fig. 105) . . ***excerptalis*** (p. 223)
– Ostium bursae strongly wrinkled, not forming a compact mass (Fig. 106) . . ***magnella*** (p. 226)
5 Forewing always with one dark fuscous spot; labial palpus long with length approximately 4 times diameter of compound eye; apophyses anteriores and apophyses posteriores short (Fig. 108) . . . . . ***melanostigma*** (p. 231)
– Forewing without dark fuscous spot; labial palpus with length less than 3 times diameter of compound eye; apophyses anteriores and apophyses posteriores slender 6
6 Ostium bursae lined with minute spines arranged in somewhat circular pattern near ductus bursae; ductus bursae between ostium bursae and ductus seminalis lined with annulated sclerotized plates (Fig. 107) . . . . . ***tongyaii*** (p. 232)
– Ostium bursae lined with irregular minute spines; ductus bursae between ostium bursae and ductus seminalis sclerotized and constricted, otherwise membranous, dilated towards corpus bursae (Fig. 111) . . . . . ***xanthogastrella*** (p. 227)

Scirpophaga excerptalis (Walker, 1863) **sp. rev.**

(Figs 49, 50, 105, 144, 145, 146, Map 7)

Chilo excerptalis Walker, 1863*a* (April): 142. Holotype ♂, INDIA: 'N. India, 48.131' (BMNH, Pyralidae genitalia slide no. 6319) [examined].

Scirpophaga monostigma Zeller, 1863 (July): 3; Hampson, 1895: 913; 1896: 46 [partim]; de Joannis, 1929: 608. Holotype ♂, locality unknown: 'Coll. H. Sch., Patria Ignota'; 'Coll. Staudinger' (MNHU, Berlin) [examined]. **Syn. n.**

Scirpophaga butyrota Meyrick, 1889: 520. LECTOTYPE ♂, NEW GUINEA: 'Port Moresby, New Guinea, K./88' (BMNH, Pyralidae genitalia slide no. 4021), here designated [examined]. **Syn. n.**

Scirpophaga intacta Snellen, 1890: 94; Hampson, 1895: 913; 1896: 46 [as synonym of *Scirpophaga auriflua* Zeller]; de Joannis, 1929: 608. Lectotype ♂, JAVA: 'Java Tagal, Luc.'; 'Dr. Krüger, Kagok, Tagal, Java, Boorder, Pl. 1, Fig. 3' (RNH, Leiden), designated by Munroe et al. (1958: 77) [examined]. **Syn. n.**

Scirpophaga excerptalis (Walker) Hampson, 1895: 913; Leech, 1901: 402 [partim]; Butani, 1970: 169 [as synonym of *Tryporyza nivella* (F.)].

[*Scirpophaga chrysorrhoa* Zeller sensu Hampson, 1895: 913 [partim]. Misidentification.]

[*Scirpophaga auriflua* Zeller sensu Hampson, 1895: 913; 1896: 46 [partim]; sensu Leech, 1901: 401 [partim]. Misidentifications.]

Topeutis [*sic*] *rhodoproctalis* Hampson, 1919*b*: 319. Holotype ♀, SINGAPORE: Singapore (*H. N. Ridley*) (BMNH, Pyralidae genitalia slide no. 6324) [examined]. **Syn. n.**

[*Scirpophaga xanthogastrella* (Walker) sensu Fletcher & Ghosh, 1920: 381, pl. 41, pl. 42, fig. 1 [partim]. Misidentification.]

[*Scirpophaga nivella* (F.) sensu Shibuya, 1928: 61, pl. 4, fig. 27 [partim]; sensu Moritsuga, 1931: 1–56 [partim]; sensu Jepson, 1954: 9, pl. 1. Misidentifications.]

Tryporyza butyrota (Meyrick) Common, 1960: 340.

[*Tryporyza nivella* (F.) sensu Butani, 1970: 169; sensu Nagaraja, 1972: 507. Misidentifications.]

♂ (Figs 144, 146). 22–28 mm. White. Length of labial palpus approximately 1·5 times diameter of compound eye. Forewing white, sometimes with dark fuscous spot at lower angle of cell, underside pale ochreous; hindwing white.

♀ (Fig. 145). 26–35 mm. White. Fore- and hindwing white; frenulum single-bristled. Anal tuft orange-red (ochreous-yellow in specimens from China, Taiwan, Japan).

GENITALIA ♂ (Figs 49, 50). Uncus moderately long, gnathos slightly wrinkled at apex; subteguminal process a long spine; valva expanded distally; manica with two sclerotized bands, at one end bearing a group of spines; aedeagus slender, vesica with coarse spines.

GENITALIA ♀ (Fig. 105). Ostium bursae broad, wrinkled, strongly sclerotized, lined with spines; ductus bursae membranous; corpus bursae with dense spines.

REMARKS. Meyrick mentioned four specimens from the same locality in the type-series of *S. butyrota*, but only three have been found and examined. One of them, the paralectotype female, is actually *S. nivella*. From the original description, it is evident that Meyrick misidentified the females, since he described the anal tuft as 'whitish-ochreous'. All females of *S. excerptalis* from New Guinea have the anal tufts orange-red.

The male of *S. excerptalis* can be separated from the other white species by the long, spine-like subteguminal process and the two sclerotized bands with spines in the manica. Externally the female can be distinguished from other similar species by having an orange-red anal tuft. However, females from China, Taiwan, Japan and the Solomon Islands have an ochreous-yellow anal tuft, but the structure of the ostium bursae, which is wrinkled, strongly sclerotized, forming a compact mass, and lined with spines, is characteristic.

It is worth noting that most of the females from Taiwan have the sclerotized ostium bursae less wrinkled than in specimens from other localities, while in the males, no differences in the genitalia could be found.

BIOLOGY (for host plants see p. 192). This species had in the past been misidentified as *S. nivella*, as mentioned under that species. *S. excerptalis*, which has the common name 'top borer', is a very serious pest of sugar cane, whereas *S. nivella* is mainly a pest of rice. The host plants of *S. excerptalis* can be found in the references under the name *S. nivella*. Whether there is only one species involved or more than one has to be carefully checked. Moritsugu (1931), cited by Jepson (1954) in his well-known review of the literature, mentioned that apart from sugar-cane, '*S. nivella*' also feeds on *Miscanthus sinensis, Imperata cylindrica, Phragmites longivalvis, Ischaemum rugosum* and *Typha capensis*. There is reason to believe that there is more than one species involved. (See discussion under *S. nivella*, p. 212.)

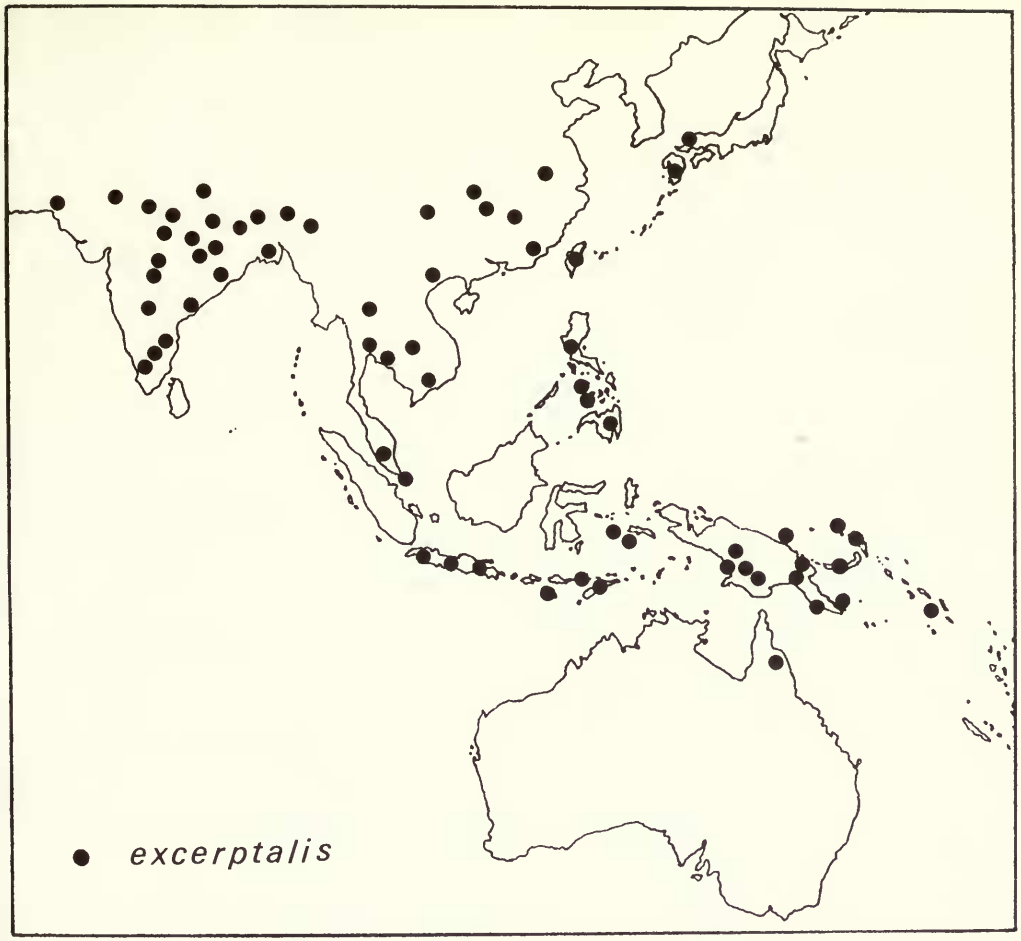
Avasthy (1968) listed the following host plants of the 'top borer' from published references: *Saccharum spontaneum* in India, Indonesia and Pakistan; *Andropogon sorghum, Chloris barbata, Echinochloa colona, Pennisetum purpureum, Panicum* sp., *Erianthus munja, Sclerostachya fusca* and *Sorghum halepense* in India; *Miscanthus sinensis, Ischaemum rugosum, Imperata arundinacea* and *Pennisetum typhoideum* in Taiwan; *Oryza sativa* in Indonesia, Japan, Malaysia, Philippines and Thailand. These host plants need to be critically checked and confirmed.

Narayanan & Vankatraman (cited by Butani, 1970) observed that a male of the plain white-winged species known as *S. nivella* bred freely with a female of the spotted-winged species known as *S. monostigma*. As the off-spring consisted of spotted and non-spotted forms, they concluded that in India there is only one species of sugar-cane 'top borer', viz. *S. nivella*. This opinion is supported by Butani (1970).

The most common species of 'top borer' on sugar-cane is *S. excerptalis* in which both sexes can be with or without spots. There is also another species, *S. magnella*, on sugar-cane which is similar externally to *S. excerptalis*. The differences between these two species are evident only in the genitalia. Their distributions partly overlap but *S. magnella* is not as widely distributed as *S. excerptalis*.

The life history of *S. excerptalis* needs to be confirmed.

DISTRIBUTION. Pakistan, India, Nepal, Bangladesh, China, Taiwan, Japan, Thailand, Vietnam, Singapore, West Malaysia, Java, Sumba Island, Timor, Buru Island, Adonara Island, Ambon



Map 7

Island, Philippines, New Guinea, New Hannover, New Britain, New Ireland, Australia, Solomon Islands.

MATERIAL EXAMINED

Pakistan: 1 ♂, Santhoro, on *Saccharum* sp., 7.vi.1964 (BMNH); 1 ♂, 1 ♀, Tandojana, on *Saccharum* sp., 24–25.iv.1965 (BMNH); 1 ♀, Tandojana, 10.vi.1964 (BMNH); 1 ♂, 1 ♀, Lyallpur (BMNH). **India**: 1 ♀, Allahabad (BMNH); 1 ♂, 1 ♀, Bangalore, resting on *Oryza sativa*, 13.x., 19.xi.1962 (BMNH); 1 ♂, 3 ♀, Coimbatore, on *Saccharum* sp., xi.1935, iv., xii.1936 (BMNH); 2 ♂, Dildarnagar, 24.ii.1903 (*Betton*) (BMNH); 1 ♀, Ganjam (BMNH); 1 ♀, Godavari District, Samalkot, at light, xii.1925 (*Rao*) (BMNH); 1 ♀, Bhopal, on *Saccharum* sp., 7.iv.1938 (BMNH); 2 ♂, Kanpur, 5–7.vi.1935 (*Sanders*) (BMNH); 1 ♂, Kanpur, on *Saccharum* sp., 27.iv.1899 (BMNH); 1 ♂, 1 ♀, Karnal, on *Saccharum* sp., 29, 31.vii.1938 (*Ahamad*) (BMNH); 6 ♂, 1 ♀, Mandya, resting on *Oryza sativa*, viii–xi.1962 (BMNH); 1 ♀, Manpur (BMNH); 1 ♂, Moghal Sarai, 28.ii.1903 (*Betton*) (BMNH); 1 ♀, New Delhi, on *Saccharum* sp., 17.iii.1938 (*Dayal*) (BMNH); 1 ♂, Pusa, 7.iii.1930 (*Gupta*) (BMNH); 1 ♂, Pusa, 25.vi.1929 (*Singh*) (BMNH); 1 ♀, Pusa, on *Saccharum* sp., 31.vii.1935 (*Khan*) (BMNH); 1 ♂, Pusa, on *Saccharum* sp., 25.vii.1914 (BMNH); 1 ♂, Pusa, on *Triticum* sp., 1.iii.1913 (BMNH); 1 ♀, Pusa, 9.iii.1928 (*Singh*) (BMNH); 1 ♀, Pusa, on *Saccharum* sp., 27.iv.1933 (*Batra*) (BMNH); 1 ♂, Pusa, 4.iii.1929 (*Hassan*) (BMNH); 1 ♂, 1 ♀, Pusa, on *Saccharum* sp., 16.vi.1932, 25.iii.1935 (BMNH); 1 ♂, Pusa, at light, 6.vii.1926 (BMNH); 1 ♂, Pusa, 10.iii.1928 (*Fletcher*) (BMNH); 1 ♂, Sambalpur, Orissa, resting on *Oryza sativa*, 25.vii.1962 (BMNH); 1 ♂, Tezpur, Assam (BMNH); 2 ♂, 2 ♀, no further data (BMNH); 2 ♂, no further data (*Hearsey*) (UM, Oxford). **Nepal**: 1 ♂, Katmandu, 1400 m, 22.viii.1964 (*Dierl*) (ZSBS, Munich); 1 ♂, 1 ♀, Rapti Tal, Monachari Khola, Belwa,

350 m, 11–12.v.1967 (*Dierl, Forster & Schacht*) (ZSBS, Munich). **Bangladesh**: 1 ♀, Bengal (BMNH). **China**: 1 ♂, Changyang, v.1888 (*Leech*) (BMNH); 1 ♂, Chin-Fu-San (*Maw*) (BMNH); 2 ♂, Hoengshan, Hunan, 4, 15.vi.1933 (*Höne*) (MAK, Bonn); 1 ♂, 1 ♀, Kuatun, Fukien, 2300 m, 13, 20.vi.1933 (*Klapperich*) (BMNH); 1 ♂, Lungtan, nr Nanking, Prov. Kiangsu, 31.v.1933 (*Höne*) (MAK, Bonn); 1 ♂, Siao-lou (BMNH); 5 ♂, 3 ♀, W. China (BMNH). **Taiwan:** 2♀, Banshorio, 24–26.v.1906 (*Wileman*) (BMNH); 35 ♂, 11 ♀, Kanshirei, 4.iv.–14.ix.1906–1909 (*Wileman*) (BMNH); 8 ♂, 3 ♀, Koannania, iv.–viii.1906 (*Wileman*) (BMNH); 30 ♂, 20 ♀, Tainan, on *Saccharum* sp. (*Chen*) (BMNH); 11 ♂, 3 ♀, Wanta nr Hori (Puli), Nan Tou Hsien, 2.iv.–8.v.1966 (CNC, Ottawa); 4 ♂, 2 ♀, 7.v.–23.vi.1906–08 (*Wileman*) (BMNH). **Japan**: 2 ♂, 2 ♀, Satsuma, Kyushu, v.1886 (*Leech Coll.*) (BMNH); 1 ♀, viii.1886 (*Leech Coll.*) (BMNH); 2 ♂, Kyushu, 14.vi., 10.viii.1958 (*Yoshii*) (CNC, Ottawa); 1 ♀, no further data, 1892 (BMNH). **Thailand**: 1 ♂, Bangkok, at light, 17.vi.1951 (*Vorasap*) (BMNH); 2 ♂, 4 ♀, Lampang, on *Saccharum officinarum*, 9–17.viii., 12.xii.1947, 1961 (*Munyeekul*) (DA, Bangkok); 3 ♀, Cholburi, on *Saccharum officinarum*, 25.vii.–4.x.1935 (*Penchitr*) (DA, Bangkok); 1 ♂, Rangsit, 22.vi.1926 (*Ladell*) (BMNH); 1 ♀, Udornthani, on *Saccharum officinarum*, 19.x.1956 (*Maneechote*) (BMNH); 7 ♂, 8 ♀, Udornthani, on *Saccharum officinarum*, 17.viii.–17.x.1954, 1958 (*Munyeekul, Pholboon, Groh*) (DA, Bangkok). **Vietnam**: 1 ♀, Tongking, 9.iii.1916 (MNHN, Paris); 1 ♀, Bin Hoa, xii.1902 (MNHN, Paris). **West Malaysia**: 1 ♂, Kuala Lumpur, 22.iii.1930 (*Corbet*) (BMNH). **Java**: 1 ♂, Besuki, 1891 (*Vaal*) (MNHN, Paris); 1 ♂, Djoenggo Ardjuno, 4500 ft [1360 m], vi.1934 (*Kalis*) (BMNH); 1 ♀, Krakatau, vii.1924 (BMNH). **Sumba Island**: 1 ♂, ii.1896 (*Doherty*) (BMNH). **Timor**: 1 ♀, Dili, v.1892 (*Doherty*) (BMNH); 1 ♀, Suai, 22–31.xii.1912 (*Wahr*) (BMNH). **Buru Island**: 1 ♂, 1922 (*Toxopeus*) (RNH, Leiden). **Adonara Island**: 4 ♂, xi.1891 (*Doherty*) (BMNH). **Ambon Island**: 2 ♂, 1 ♀, no further data (BMNH). **Philippines**: 14 ♂, 8 ♀, Luzon Benquet, Klondyke, 800 ft [240 m], 18.xii.1911–24.v.1912 (*Wileman*) (BMNH); 1 ♂, 2 ♀, Montalban, 25.i.–11.v.1914 (*Wileman*) (BMNH); 2 ♀, Benquet, Palali, 2000 ft [600 m], 28–30.vi.1913 (*Wileman*) (BMNH); 4 ♂, 3 ♀, Mt Makiling, Luzon (NMNH, Washington); 1 ♀, Panay (*Wahr*) (BMNH); 4 ♂, 6 ♀, Victorias occ. Negros, on *Saccharum* sp., v.,x. (*Pierce*) (NMNH, Washington); 2 ♂, Canlubang, 821 m, 26–29.xi.1927 (NMNH, Washington); 1 ♂, 2 ♀, Mindanao, x. (NMNH, Washington); 1 ♂, Los Banos, 14.ii.1922 (*Woodworth*) (NMNH, Washington); 1 ♀, Los Banos, on *Saccharum sponteneum*, 17.ii.1928 (*Fernandez*) (NMNH, Washington). **New Guinea**: 1 ♂, Port Moresby, New Guinea, K./88 (BMNH) (paralectotype of *Scirpophaga butyrota* Meyrick); 4 ♂, 1 ♀, Kumusi R., v.–vii.1907 (*Meek*) (BMNH); 3 ♀, Upper Setekwa R., Snow Mts, 2000–3000 ft [600–910 m], viii.1910 (*Meek*) (BMNH); 1 ♀, Mt Goliath, 5000–7000 ft [1500–2100 m], ii.1911 (*Meek*) (BMNH); 1 ♀, Astrolabe Bay, vii. (*Wahnes*) (BMNH); 2 ♂, 1 ♀, Wataikwa R., viii., x.1910 (*Wollaston*) (BMNH); 3 ♂, 1 ♀, Ninay Valley, 3500 ft [1060 m], ii., iii.1909 (BMNH); 2 ♀, Utakwa R., xii.1912, i.1913 (*Wollaston*) (BMNH); 2 ♀, Mt Hagen, on *Saccharum robustum*, ii.1964 (*Simmonds*) (BMNH); 5 ♂, 3 ♀, Dampier Is., ii., iii.1914 (*Meek*) (BMNH); 1 ♂, Haidana, Collingwood Bay, iv.1907 (*Meek*) (BMNH); 1 ♂, Milene Bay, xi.1898 (*Meek*) (BMNH); 2 ♂, Aiyura, 6000 ft [1820 m], 27.ix.1957 (*Munroe & Holland*) (CNC, Ottawa); 3 ♂, Padwe, Sepik R., 26.x.1957 (*Munroe & Holland*) (CNC, Ottawa); 1 ♂, Lae, 30.viii.1957 (*Munroe & Holland*) (CNC, Ottawa); 1 ♂, Koigin, 1200 ft [360 m], 22.x.1957 (*Munroe & Holland*) (CNC, Ottawa); 4 ♂, 3 ♀, Boroko, nr Port Moresby, 300 ft [90 m], 19.viii.1957 (*Munroe & Holland*) (CNC, Ottawa); 1 ♂, Brown R., Karema, 20.viii.1957 (*Munroe & Holland*) (CNC, Ottawa); 1 ♀, Kokoda, 1200 ft [360 m], x.1933 (*Cheesman*) (BMNH); 5 ♂, 1 ♀, Vulcan I., xi.1913–i.1914 (*Meek*) (BMNH); 6 ♂, 2 ♀, Fergusson I., ix.1894 (*Meek*) (BMNH); 1 ♀, Fergusson I., xii.1895 (BMNH); 1 ♂, Fergusson I., Deidei, Comwa Bay (BMNH); 1 ♂, 2–6.vii.1956 (*Brass*) (BMNH); 1 ♀, Long I., 24–27.v.1932 (BMNH). **New Hannover**: 1 ♂, iii.1923 (*Meek*) (BMNH). **New Britain**: 1 ♂, 2 ♀, i.–ii.1925 (*Eichhorn*) (BMNH). **New Ireland**: 2 ♂, xi, xii.1923 (*Eichhorn*) (BMNH). **Australia**: 1 ♀, Kuranda, Queensland, x.1919 (*Dodd & Sons*) (BMNH). **Solomon Islands**: 3 ♀, Guadalcanal I., Honiara, 8–18.xi.1953 (*Bradley*) (BMNH).

Scirpophaga magnella de Joannis, 1929
(Figs 51, 52, 106, 147, 148, 149, Map 6)

Scirpophaga magnella de Joannis, 1929: 608. Holotype ♀, VIETNAM: 'Choganh [Tongking], vi., 1920–1932, Coll. L. & J. de Joannis' (MNHN, Paris) [examined].

[*Scirpophaga monostigma* Zeller sensu Hampson, 1895: 913; 1896: 46 [partim]. Misidentification.]

[*Scirpophaga auriflua* Zeller sensu Leech, 1901: 401 [partim]. Misidentification.]

♂ (Fig. 148). 25–40 mm. External characters as in *S. excerptalis*.

♀ (Figs 147, 149). 32–49 mm. External characters as in *S. excerptalis* but sometimes forewing with one dark fuscous spot at lower angle of cell. Anal tuft always ochreous-yellow.

GENITALIA ♂ (Figs 51, 52). Uncus and gnathos slightly bent downwards; tegumen with dorsal sclerotized thickening X-shaped, sometimes the lower part weak, resulting in a more or less Y-shaped structure;

subteguminal process stout, spine-like, valva with apex more or less pointed; manica with two groups of spines; aedeagus slender, vesica with coarse spines.

GENITALIA ♀ (Fig. 106). Ostium bursae broad, wrinkled, lined with spines; ductus bursae membranous, section between ostium bursae and ductus seminalis with a strong sclerotized plate.

REMARKS. *S. magnella* is very similar externally to *S. excerptalis* with which it is partially sympatric. The males are best separated from the latter by the difference in the shape of the subteguminal process of the genitalia. In *S. magnella* the process is in the form of a stout short spine, while in *S. excerptalis* it is a more slender long spine. The female of these two species can be distinguished by the colour of the anal tuft, which is usually orange-red in *S. excerptalis* and ochreous-yellow in *S. magnella*. Furthermore, in the genitalia the ostium bursae of *S. excerptalis* is strongly wrinkled and sclerotized, while in *S. magnella* it is less wrinkled.

BIOLOGY (for host plants see p. 192). The life history of this species is not known for certain; it has probably been confused with *S. excerptalis* and studied under the name *S. nivella*.

DISTRIBUTION. Iran, Afghanistan, Pakistan, India, Nepal, Bangladesh, Burma, Thailand, Vietnam, China, Hong Kong.

MATERIAL EXAMINED

Iran: 2 ♂, Baluchistan, Anfang, Tahte-Malek, 750 m, v. 1938 (*Brandt*) (LN, Karlsruhe). **Afghanistan**: 1 ♂, Sarobi, 1100m, 2.vi.1961 (*Ebert*) (ZSBS, Munich); 1 ♀, Barikot, Nuristan, 1800 m, 12–17.vii.1963 (*Kasy & Vartian*) (NM, Vienna). **Pakistan**: 1 ♂, Campbellpore (BMNH); 1 ♀, Campbellpore, 28,viii.1885 (BMNH); 1 ♀, Rawalpindi, on *Saccharum bengalense*, 7.xii.1960 (BMNH); 1 ♂, Lahore (BMNH). **India:** 1 ♂, Chausa, 17.iii.1904 (*Betton*) (BMNH); 1 ♂, 1 ♀, Dharmsala (BMNH); 1 ♂, Kanpur [Cawnpore], 20.iii.1905 (*Betton*) (BMNH); 1 ♀, Kapurthala, Punjab, resting on *Oryza sativa*, ix.1962 (BMNH); 2 ♂, 1 ♀, Manpur (BMNH); 1 ♂, Margarita, Upper Assam, v.1889 (*Doherty*) (BMNH); 1 ♂, 1 ♀, Mughal Sarai, 10.iii.1904 (*Betton*) (BMNH), 1 ♂, Punjab, vii.1886 (BMNH); 1 ♂, Pusa, at light, 27.v.1932 (BMNH); 1 ♀, Roorkee, 30.vi.1934 (*Graham*) (BMNH); 1 ♀, Sandi, iii.1880 (BMNH); 1 ♂, Montrpur, on *Erianthus munja*, iii.1971 (BMNH); 2 ♂, 3 ♀, NW. India (BMNH); 4 ♂, no further data (BMNH); 1 ♀, no further data (*Hearsey*) (UM, Oxford). **Nepal**: 1 ♂, Barang (BMNH); 2 ♂, 1 ♀, Rapti Tal 300 m, 23.iii.–4.iv.1962 (*Ebert & Falkner*) (ZSBS, Munich). **Bangladesh**: 1 ♂, 1 ♀, Furshedpur, on *Saccharum* sp., 23.vii.1968 (BMNH); 1 ♂, Chandkhir, Sylhet (BMNH); 1 ♀, Kushtia, on *Saccharum* sp. (BMNH); 1 ♀, Bengal (BMNH). **Burma**: 1 ♂, Rangoon (BMNH). **Thailand**: 1 ♀, Chiangmai, 1000 ft [300 m], 8.v.1939 (*Tongyai*) (DA, Bangkok). **Vietnam**: 1 ♂, Cha Pa, Tongking, ii.1929 (MNHN, Paris); 1 ♂, Ngan-Son, Tongking (BMNH); 1 ♀, Tongking (*Cooman*) (MNHN, Paris. **China**: ♂, Hainan, vi.1906 (BMNH); 1 ♂, Ichang, vi.1888 (BMNH); 1 ♂, 1 ♀, no further data (BMNH). **Hong Kong**: 1 ♀, v.1892 (BMNH).

Scirpophaga xanthogastrella (Walker, 1863)
(Figs 65, 66, 111, 150, 151, Map 4)

Apurima xanthogastrella Walker, 1863*a*: 194; Moore, 1867: 666; 1886: 388, pl. 184, fig. 14; Hampson, 1895: 913; 1896: 46 [as synonym of *Scirpophaga auriflua* Zeller]; Aurivillius, 1898: 169 [as synonym of *Crambus nivella* F.]; Shibuya, 1928: 61 [as synonym of *Scirpophaga nivella* (F.)]; Butani, 1970: 169. Holotype ♀ [not ♂ as stated by Walker], INDIA: 'S. Ind 61.20' (BMNH, Pyralidae genitalia slide no. 6318) [examined].

Apurima costalis Moore, 1886: 388, pl. 184, fig. 15. Holotype ♂, SRI LANKA: 'Moore Coll. 94.106' (BMNH, Pyralidae genitalia slide no. 6342) [examined]. **Syn. n.**

Schoenobius xanthogastrella (Walker) Hampson, 1893: 46.

Schoenobius costalis (Moore) Hampson, 1893: 46; 1895: 917; 1896: 49.

Scirpophaga xanthogastrella (Walker) Meyrick, 1894: 11; Fletcher, 1928: 58 [as synonym of *Scirpophaga nivella* (F.)].

♂ (Fig. 150). 22–30 mm. Pale ochreous white. Length of labial palpus approximately 2·5 times diameter of compound eye. Forewing pale ochreous white, underside fuscous; hindwing pale ochreous white, underside with fuscous suffusion in costal half.

♀ (Fig. 151). 27–36 mm. White. Fore- and hindwing white on both surfaces; frenulum single-bristled. Anal tuft ochreous yellow.

GENITALIA ♂ (Figs 65, 66). Tegumen with dorsal sclerotized thickening X-shaped, subteguminal process small, spine-like; manica with uniformly arranged minute spines; aedeagus with minute spines on vesica.

GENITALIA ♀ (Fig. 111). Ostium bursae broad, membranous, slightly wrinkled, with minute spines denser towards ductus bursae; ductus bursae membranous, gradually dilated towards corpus bursae, section between ostium bursae and ductus seminalis constricted, lined with sclerotized plate; corpus bursae with dense spines.

REMARKS. This species can be separated from the other white species in this group by the long labial palpus in both sexes, the small spine-like subteguminal process in the male genitalia, and the gradual dilation of the membranous ductus bursae towards the corpus bursae in the female genitalia.

BIOLOGY. Fletcher & Ghosh (1920) studied the life cycle of an Indian species which they probably misidentified as *S. xanthogastrella*. The host plants recorded were sugar-cane, kanra (*Saccharum arundinaceum*) and batri (*Saccharum spontaneum*). From the same batch of pupae the adults emerged in two forms, with and without a spot on the forewing. The form with a spot was identified as *Scirpophaga monostigma* Zeller, and the one without a spot as *Scirpophaga xanthogastrella* (Walker). Also from the illustrations (pl. 41, figs 10, 12) there were two female forms, one with a yellow anal tuft, the other orange-red. These differences suggest misidentification. The form with the orange-red anal tuft was certainly *Scirpophaga excerptalis* (Walker) which in both sexes can be with or without a spot on the forewing. The other form, in which the female has the anal tuft yellow, is difficult to identify positively but is most likely *Scirpophaga magnella* de Joannis. This species is also a pest of sugar-cane and the adult has two forms; it is partially sympatric with *S. excerptalis*. The morphology of *S. excerptalis* and *S. magnella* is very similar.

DISTRIBUTION. Sri Lanka, India, Nepal, Taiwan, Philippines.

MATERIAL EXAMINED

Sri Lanka: 1 ♂, Galboda, iv.1904 (BMNH); 1 ♂, 1 ♀, Galboda (BMNH); 2 ♀, Pundaloya, iii.1897 (BMNH); 3 ♂, 7 ♀, Pundaloya (BMNH); 9 ♂, 7 ♀, no further data (BMNH). **India**: 1 ♀, Travancore (BMNH); 1 ♀, Alumihare, 6.v.1885 (NMNH, Washington). **Nepal**: 1 ♂, Chisapani Garhi, 1600 m, 11–15.vii.1967 (*Dierl & Schacht*) (ZSBS, Munich); 1 ♀, Likhu Khola Tal, 1700 m, 4.vi.1962 (*Ebert & Falkner*) (ZSBS, Munich). **Taiwan**: 1 ♂, Banshorio, 26.v.1906 (*Wileman*) (BMNH); 1 ♂, 1 ♀, Kanshirei, 27.iv., 25.v.1908 (*Wileman*) (BMNH). **Philippines**: 1 ♂, Klondyke Bonquet, Luzon, 9.v.1912 (*Wileman*) (BMNH); 1 ♀, Baquio, 17.v.1907 (*Betton*) (BMNH).

Scirpophaga brunnealis (Hampson, 1919) **comb. n.**
(Figs 55, 56, 152, Map 5)

Topeutis [*sic*] *brunnealis* Hampson, 1919*b*: 319. Holotype ♂, BURMA: 'Up. Chindwisi Dist. [Upper Chindwin District], 96–140' (BMNH, Pyralidae genitalia slide no. 13470) [examined].

♂ (Fig. 152). 27–29 mm. Ochreous brown. Length of labial palpus approximately 3 times diameter of compound eye. Forewing dull ochreous brown, one dark fuscous spot at lower angle of cell, underside fuscous; hindwing ochreous brown on both surfaces.

♀ Unknown.

GENITALIA ♂ (Figs 55, 56). Uncus and gnathos relatively long; subteguminal process slender, spine-like; valva broad, expanded distally; manica with two groups of spines; aedeagus slender; vesica with coarse spines.

REMARKS. The dull ochreous brown forewing with a dark spot separates *S. brunnealis* from other species of this group. In the genitalia, the slender uncus and gnathos, together with the broad valva and the shape of the subteguminal process, are characteristic.

BIOLOGY. Unknown.

DISTRIBUTION. Burma, Nepal.

MATERIAL EXAMINED

Burma: 1 ♂, Upper Chindwin District (BMNH); 1 ♂, Katha (BMNH). **Nepal**: 1 ♂, Rapti Tal, 20 mls [39 km] W. Hitora, 300 m, 23–27.iii.1962 (*Ebert & Falkner*) (ZSBS, Munich).

Scirpophaga ochritinctalis (Hampson, 1919) **comb. n.**

(Figs 57, 58, 109, 154, 155, Map 13)

Schoenobius ochritinctalis Hampson, 1919*b*: 323. Holotype ♂, SIERRA LEONE: S. Leone, 19.iv.1875 (*Clements*) (BMNH, Pyralidae genitalia slide no. 6341) [examined].

Scirpophaga macrostoma Meyrick, 1933: 377. LECTOTYPE ♀, ZAIRE: Luebo, xi.1931 (*J. P. Colin*) (MRAC, Tervuren), here designated [examined]. **Syn. n.**

Schoenobius macrostomus (Meyrick) Meyrick, 1935: 554.

♂ (Fig. 154). 24–31 mm. White. Length of labial palpus approximately 2·5 times diameter of compound eye. Forewing pale ochreous-white, underside fuscous; hindwing white, underside suffused with fuscous in costal half.

♀ (Fig. 155). 27–39 mm. White. Forewing very pale yellowish white, underside white; hindwing white; frenulum single-bristled. Anal tuft ochreous yellow.

GENITALIA ♂ (Figs 57, 58). Subteguminal process straight, spine-like; valva truncate distally, costal and ventral margins more or less parallel; aedeagus slender, vesica with coarse spines.

GENITALIA ♀ (Fig. 109). Ostium bursae broad, membranous, cup-shaped, lined with minute spines, especially towards ductus bursae; ductus bursae membranous, section between ostium bursae and ductus seminalis lined with annulated sclerotized plates.

REMARKS. This species can be distinguished from the other white species by the genital structures. In the male, the subteguminal process is a straight spine. In the female, the ostium bursae is cup-shaped and the sclerotized part between the ostium bursae and the ductus seminalis is annulated.

BIOLOGY. Unknown.

DISTRIBUTION. Sierra Leone, Ghana, Nigeria, Central African Republic, Zaire, Uganda, Tanzania, Malawi, Zambia, Angola.

MATERIAL EXAMINED

Ghana: 1 ♀, Achimota, 3.v.1959 (*Morton*) (BMNH); 4 ♀, Kete-Krachi (*Cardinall*) (BMNH). **Nigeria**: 1 ♀, Abinsi, Benue R., 6.xii.1912 (BMNH); 2 ♀, Lagos (BMNH). **Central African Republic**: 4 ♀, Fort Crampel (MNHN, Paris). **Zaire**: 1 ♂, 2 ♀, Arebe, ii (BMNH); 1 ♂, Kadjudju (MNHN, Paris); 1 ♂, Matadi, xi.1931 (MNHN, Paris); 1 ♂, Sankuru, Katako-Kombe, 13.xi.1952 (*Fontaine*) (MRAC, Tervuren). **Uganda**: 4 ♂, 1 ♀, Banda, 26.ii, 13.iii.1899 (*Ansorge*) (BMNH); 1 ♂, 2 ♀, Buekulla, 1899 (*Ansorge*) (BMNH); 1 ♂, Mondo, 11.iii.1899 (*Ansorge*) (BMNH); 3 ♀, Usoga, Mlamba, 4.iii.1899 (*Ansorge*) (BMNH); 5 ♂, Kampala, 10–22.iii.1897, 1899 (*Ansorge*) (BMNH); 1 ♀, Kampala, iii.1900 (*Rattray*) (BMNH); 2 ♀, Kasoha, Unyoro, 11, 25.viii.1897 (*Ansorge*) (BMNH); 2 ♀, Monyonya, Unyoro, 18.iii.1897 (*Ansorge*) (BMNH); 3 ♂, Kilwalogomma (*Ansorge*) (BMNH). **Tanzania**: 1 ♂, 1 ♀, Mpembene, 3760 ft [1140 m], 15.x.1947 (BMNH); 1 ♀, Rukuba Hill, 37 mls [59 km] W. of Nyanza, at light, 7.xi.1915 (*Carpenter*) (BMNH). **Malawi**: 6 ♂, 3 ♀, Mt Mlanje, Luchenya R., 28.x.1913–5.i.1914 (*Neave*) (BMNH); 1 ♂, Ruo Valley, 200 ft [60 m], 16.xii.1913 (*Neave*) (BMNH). **Zambia**: 1 ♂, Lake Bangweulu nr Monfuli, 2.x.1946 (BMNH); 1 ♀, Mpeika, xi.1930 (*Kettlewell*) (BMNH). **Angola**: 1 ♂, Fort Don Carlos, 21.ix.1903 (*Ansorge*) (BMNH).

Scirpophaga bradleyi **sp. n.**

(Figs 59, 60, 110, 156, 157, Map 13)

♂ (Fig. 156). 37 mm. Pale ochreous. Length of labial palpus approximately 2·8 times diameter of compound eye. Forewing pale ochreous, underside fuscous; hindwing pale ochreous, costal half suffused with pale ochreous on upperside, fuscous on underside.

♀ (Fig. 157). 37 mm. White. Fore- and hindwing suffused with very pale ochreous; frenulum single-bristled. Anal tuft pale ochreous.

GENITALIA ♂ (Figs 59, 60). Uncus and gnathos relatively short; tegumen large, dorsal sclerotized thickening X-shaped; subteguminal process long, plate-like; aedeagus slender; manica with two groups of spines; vesica with coarse spines.

GENITALIA ♀ (Fig. 110). Ostium bursae broad, membranous, lined with minute spines, denser towards ductus bursae; ductus bursae membranous, section between ostium bursae and corpus bursae sclerotized; corpus bursae with dense spines; apophyses anteriores and apophyses posteriores short.

REMARKS. This species is similar to *S. ochritinctalis* in general appearance. It can be distinguished from the latter by the structure of the genitalia. In the male of *S. bradleyi,* the relatively short uncus and gnathos, the broad tegumen and especially the long plate-like shape of the subteguminal process enable it to be separated from other species in the group. In the female of *S. bradleyi* the ostium bursae, close to the ductus bursae, is lined with less dense spines than in *S. ochritinctalis*. In addition the sclerotized section of the ductus bursae between the ostium bursae and the ductus seminalis is not annulated as it is in *S. ochritinctalis*. The apophyses anteriores and posteriores are also short in *S. bradleyi*.

BIOLOGY. Unknown.

DISTRIBUTION. Angola.

MATERIAL EXAMINED

Holotype ♂, **Angola**: Fort Don Carlos, 21.ix.1903 (*Dr Ansorge*) (BMNH, Pyralidae genitalia slide no. 11013).

Paratype. 1 ♀, same data as holotype but 22.ix.1903 (BMNH, Pyralidae slide no. 11014).

This species is named after Dr J. D. Bradley, Commonwealth Institute of Entomology, London.

Scirpophaga khasis sp. n.
(Figs 61, 62, 153, Map 4)

♂ (Fig. 153). 26–33 mm. Head pale ochreous white. Length of labial palpus approximately 2 times diameter of compound eye. Forewing shining pale ochreous white with dark fuscous spot at lower angle of cell, underside fuscous; hindwing pale ochreous white, underside fuscous in costal half.

♀. Unknown.

GENITALIA ♂ (Figs 61, 62). Uncus and gnathos relatively long, slender; subteguminal process sclerotized, tuberculiform; valva broad distally; manica with two bands of sclerotized plates bearing spines at one end; aedeagus slender, vesica with coarse spines.

REMARKS. This species can be very similar to some specimens of *S. excerptalis* and *S. magnella* in which the forewing has a dark fuscous spot at the lower angle of the cell, but the wings of *S. khasis* are more shining. In the genitalia, the tuberculiform nature of the subteguminal process, together with the two bands of sclerotized plates bearing spines at one end and the coarse spines in the vesica, are characteristic of this species.

BIOLOGY. Unknown.

DISTRIBUTION. India.

MATERIAL EXAMINED

Holotype ♂, **India**: Khasis [Khasi Hills, 25°30′N, 91°30′E], Paravicini Coll. (BMNH, Pyralidae genitalia slide no. 13448).

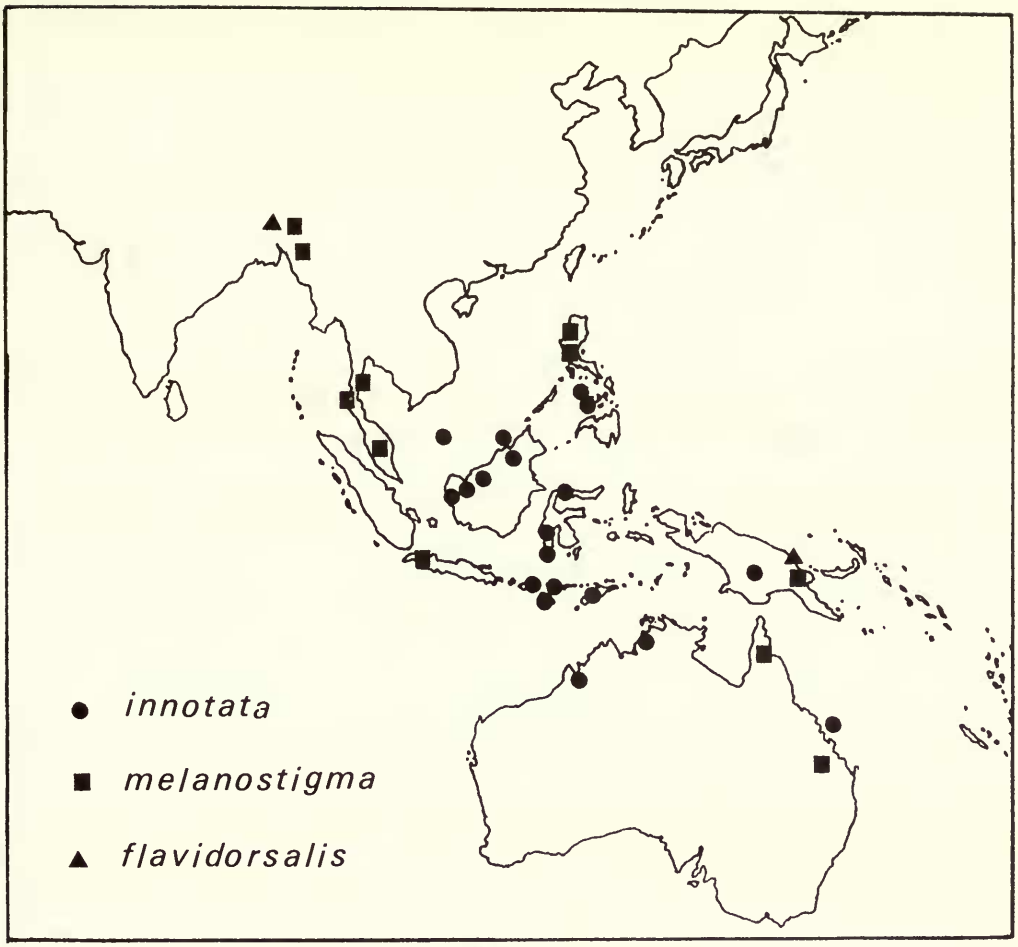
Paratypes. **India**: 10 ♂, same data as holotype; 1 ♂, Khasis, 16.v.1894; 5 ♂, Khasis, iv.1894; 7 ♂, Khasis (all BMNH); 2 ♂, Khasis (UM, Oxford).

Scirpophaga flavidorsalis (Hampson, 1919) comb. n.
(Figs 63, 64, 158, Map 8)

Topeutis [*sic*] *flavidorsalis* Hampson, 1919*b*: 319. Holotype ♂, BHUTAN: 2.vii.1855 (*Dudgeon*) (BMNH, Pyralidae genitalia slide no. 6325) [examined].

♂ (Fig. 158). 18–28 mm. Pale ochreous white. Labial palpi with spreading scales, in length approximately 3 times diameter of compound eye. Forewing pale ochreous with dark fuscous spot at the lower angle of cell, underside fuscous; hindwing pale ochreous, underside fuscous in costal half.

♀. Unknown.



Map 8

GENITALIA ♂ (Figs 63, 64). Tegumen with dorsal sclerotized thickening X-shaped; subteguminal process tubercle-like, valva relatively short; manica with two groups of spines; aedeagus expanded at distal end, cornutus a flat plate with serrated margin.

REMARKS. Only two males are known; although the specimen from New Guinea is much smaller than the holotype, no differences in the genitalia could be found.

BIOLOGY. Unknown.

DISTRIBUTION. Bhutan, New Guinea.

MATERIAL EXAMINED

New Guinea: 1 ♂, Astrolabe Bay (*Wahnes*) (BMNH).

Scirpophaga melanostigma (Turner, 1922) **comb. n.**
(Figs 108, 159, Map 8)

Schoenobius melanostigmus Turner, 1922: 47. Holotype ♀ [not ♂ as stated by Turner (Common, 1960)], AUSTRALIA: Queensland, Claudie R., 1914 (*J.A.K.*) (NMV, Melbourne) [not examined].
Tryporyza melanostigma (Turner) Common, 1960: 342, fig. 8G, pl. 2, fig. 3.

♂. Unknown.

♀ (Fig. 159). 23–26 mm. White. Labial palpus with spreading scales, in length approximately 4 times diameter of compound eye. Forewing white, gradually changing to pale ochreous towards apex, one dark

fuscous spot at the lower angle of the cell; hindwing white; frenulum single-bristled. Anal tuft pale ochreous white.

GENITALIA ♀ (Fig. 108). Ostium bursae broad, membranous, lined with minute spines, weakly sclerotized towards ductus bursae; ductus bursae membranous; ductus seminalis arising from ductus bursae near ostium bursae; corpus bursae lined with dense spines.

REMARKS. There is some evidence that *S. flavidorsalis* (known from the male only) and *S. melanostigma* (known from the female only) may be opposite sexes of the same species. A male without the abdomen in the NMNH, Washington has the same label data as a female of *S. melanostigma* from Trang, Thailand, and these two specimens are externally very similar.

In the BMNH there are a male of *S. flavidorsalis* and a female of *S. melanostigma* from New Guinea with identical data.

This species can be recognized externally by having a long labial palpus with spreading scales and a dark fuscous spot on the forewing.

BIOLOGY. Unknown.

DISTRIBUTION. India, Bangladesh, Thailand, West Malaysia, Java, Philippines, New Guinea, Australia.

MATERIAL EXAMINED

India: 1 ♀, Brahmaputra, 27.v.1961 (*Scherer*) (ZSBS, Munich). **Bangladesh**: 1 ♀, Chittagong (BMNH). **Thailand**: 1 ♀, Trang (*Abbott*) (NMNH, Washington); 1 ♀, Chumporn, 12.v.1956 (*Pholboon*) (DA, Bangkok). **West Malaysia**: 1 ♀, Kuala Lumpur, at light, 18.viii.1941 (BMNH); 3 ♀, Kuala Lumpur, at light, 5–6.ii., 25–26.iii.1924 (BMNH). **Java**: 4 ♀, Radjamandala, 350 m, xii.1940 (*Olthof*) (RNH, Leiden). **Philippines**: 3 ♀, Palali, 2000 ft [600 m], 28.vi.–1.vii.1913 (*Wileman*) (BMNH); 1 ♀, Klondyke, 4.vi.1913 (*Wileman*) (BMNH); 1 ♀, Mt Makiling, Luzon (*Baker*) (NMNH, Washington). **New Guinea**: 1 ♀, Astrolabe Bay (*Wahnes*) (BMNH). **Australia**: 1 ♀, Queensland, Claudie R., 20.ii.1914 (*Kershaw*) (ANIC, Canberra) (paratype of *Schoenobius melanostigmus* Turner); 1 ♀, Iron Range, Queensland, 15.iv.1964 (*Common & Upton*) (BMNH).

Scirpophaga tongyaii sp. n.

(Figs 53, 54, 107, 160, 161, Map 5)

♂ (Fig. 160). 25–29 mm. Pale ochreous white. Length of labial palpus approximately twice diameter of compound eye. Forewing pale ochreous white, underside fuscous; hindwing pale ochreous white with fuscous suffusion in costal third.

♀ (Fig. 161). 31–39 mm. White. Fore- and hindwing white on both surfaces; frenulum single-bristled. Anal tuft ochreous yellow.

GENITALIA ♂ (Figs 53, 54). Uncus broad; gnathos slender, curved towards uncus; tegumen with dorsal sclerotized thickening in two lines with a tendency to join, forming an X-shaped structure; subteguminal process spine-like; valva with apex pointed posteriorly; manica with two groups of spines; aedeagus slender, vesica with coarse spines.

GENITALIA ♀ (Fig. 107). Ostium broad, membranous, lined with spines towards ductus bursae; ductus bursae membranous, section between ostium bursae and ductus seminalis lined with sclerotized annulations; corpus bursae with dense spines.

REMARKS. This species can be distinguished from the other white species by genitalic structures in both sexes. In the male the uncus is broad and the gnathos is slender, quite distinct from other species. The dorsal sclerotized thickening of the tegumen in the holotype consists of two narrowly separated lines. In some specimens these lines tend to converge in the middle to form a more or less X-shaped structure. The female genitalia are very similar to those of *S. bradleyi* but the sclerotized part between the ostium bursae and the ductus seminalis of *S. tongyaii* is annulated as in *S. ochritinctalis*. The arrangement of the spines in the ostium bursae of *S. tongyaii* and *S. ochritinctalis* is quite different. Furthermore *S. bradleyi* and *S. ochritinctalis* are known only from Africa while *S. tongyaii* is from Asia.

BIOLOGY. Unknown.

DISTRIBUTION. Thailand, Burma, India.

MATERIAL EXAMINED

Holotype ♂, **Thailand**: Kaochong, Trang [7°35′N, 99°35′E], 1–18.iv.1960 (*P. Pholboon*) (DA, Bangkok, Pyralidae genitalia slide no. 114).

Paratypes. **Thailand**: 2 ♀, same data as holotype (DA, Bangkok); 1 ♂, 1 ♀, same data as holotype, but 15.iv.1960 (BMNH); 1 ♂, 1 ♀, same data (DA, Bangkok); 2 ♂, 4 ♀, Trong [Trang], (*Abbott*) (NMNH, Washington).

Non-paratypic material. **Thailand**: 1 ♀, Krabi, 7–25.iv.1962 (*Friedel*) (ZSBS, Munich). **Burma**: 1 ♂, Hkamkawn, 4000 ft [1210 m] (*Swann*) (BMNH). **India**: 2 ♂, Kangra Valley, 4500 ft [1360 m], vii.1899 (*Dudgeon*) (BMNH); 1 ♂, Khasi Hills, Shillong, 5000 ft [1510 m], 12.vi.1923 (*Fletcher*) (BMNH).

This species is named after Dr M. R. Chakratong Tongyai, the Minister of Agriculture, Thailand (at the time of this study) who has made great contributions to entomology, especially in the field of insect taxonomy in Thailand.

The *occidentella*-group

Forewing with vein R_1 usually not anastomosing with *Sc*. Frenulum in male a single bristle, in female with single or double bristle.

GENITALIA ♂. Uncus and gnathos slender, gnathos arms usually converging abruptly, curved towards uncus; tegumen with dorsal sclerotized thickening long, ×-shaped; subteguminal process lobe-like; anellus with dense, strongly sclerotized spines; manica with uniformly arranged minute spines; aedeagus slender, vesica with minute spines.

GENITALIA ♀. Ostium bursae relatively broad, membranous, lined with minute spines; ductus bursae menbranous; ductus seminalis originating from ostium bursae at same level as ductus bursae, this area lined with sclerotized plates; corpus bursae membranous or with spines.

The *occidentella*-group consists of eight species. Five are endemic in Africa: *S. occidentella*, *S. subumbrosa*, *S. marginepunctella*, *S. serena* and *S. goliath*; two in Asia: *S. virginia* and *S. fusciflua*; and one in New Guinea and Australia, *S. ochroleuca*.

Key to species of the *occidentella*-group

Males

The male of *S. goliath* is unknown.

1 Forewing ochreous with markings 2
– Forewing ochreous or ochreous white, without markings 3
2 Anellus with dense strong spines; subteguminal process bilobed; valva broad (Fig. 79) ***marginepunctella*** (p. 238)
– Anellus with strong spines laterally; subteguminal process single-lobed; valva narrow (Fig. 81) ***serena*** (p. 239)
3 Anellus with dense strong spines; subteguminal process bilobed (Fig. 77) . ***subumbrosa*** (p. 237)
– Anellus with strong spines laterally; subteguminal process varied 4
4 Uncus broad, tapering, constricted abruptly near apex; subteguminal process large, bilobed (Fig. 69) . . . . . ***occidentella*** (p. 234)
– Uncus slender, tapering towards apex; subteguminal process not large 5
5 Subteguminal process rounded (Fig. 75). . . . . ***virginia*** (p. 236)
– Subteguminal process bilobed or slightly bilobed 6
6 Forewing ochreous; gnathos long; subteguminal process slightly bilobed (Fig. 73) ***ochroleuca*** (p. 235)
– Forewing pale ochreous white; gnathos relatively short; subteguminal process strongly bilobed (Fig. 71) . . . . . ***fusciflua*** (p. 234)

Females

1 Frenulum double 2
– Frenulum single 5
2 Corpus bursae with dense spines (Fig. 117) . . . . . ***subumbrosa*** (p. 237)
– Corpus bursae membranous or with very few spines 3
3 Corpus bursae with very few spines; ostium bursae without longitudinal wrinkles towards ductus bursae (Fig. 118) . . . . . ***marginepunctella*** (p. 238)

– Corpus bursae membranous, without spines; ostium bursae with longitudinal wrinkles towards ductus bursae (Figs 119, 120) 4

4 Forewing ochreous, costal area with pale ochreous white suffusion from base to apex of vein R_2 ***serena*** (p. 239)

– Forewing fuscous; costal area with pale ochreous white suffusion from base to apex of vein R_3 ***goliath*** (p. 239)

5 African species . . . . . ***occidentella*** (p. 234)

– Asian or Australian species . . . ***fusciflua*** (p. 234), ***ochroleuca*** (p. 235), ***virginia*** (p. 236)

Scirpophaga occidentella (Walker, 1863)
(Figs 69, 70, 113, 162, 163, Map 14)

Rupela occidentella Walker, 1863*b*: 524. Holotype ♀ [not ♂ as stated by Walker], SIERRA LEONE: '58–166, S. Leone' (BMNH, abdomen missing) [examined].

Scirpophaga occidentella (Walker) Hampson, 1895: 913; Meyrick, 1933: 376.

Topeutis [*sic*] *occidentella* (Walker) de Joannis, 1927: 189.

♂ (Fig. 162). 16–22 mm. White. Length of labial palpus approximately 1·3 times diameter of compound eye. Fore- and hindwing white, underside fuscous, paler on hindwing.

♀ (Fig. 163). 20–30 mm. White. Fore- and hindwing white on both surfaces; frenulum single-bristled. Anal tuft pale ochreous white.

GENITALIA ♂ (Figs 69, 70). Uncus broad, tapering, constricted abruptly near apex; subteguminal process large, bilobed; anellus with strong spines laterally.

GENITALIA ♀ (Fig. 113). Corpus bursae membranous.

REMARKS. Examination of the holotype of this species has revealed that it is a female and not a male as stated in the original description. As the abdomen is missing it has not been possible to determine other specimens by genitalic characters. Fortunately, however, the female of this species has only a single-bristled frenulum, which at once separates it from the double-bristled frenulum of the other species in this species-group occurring in Africa, and the size in general is also smaller. For these reasons, the specimens examined have been referred to *S. occidentella.*

BIOLOGY. According to the label data of the material examined, the host plant is *Oryza sativa* (Nigeria).

DISTRIBUTION. Senegal, Sierra Leone, Ivory Coast, Nigeria, Zaire, Tanzania, Angola, Mozambique, South Africa, Madagascar, Malawi.

MATERIAL EXAMINED

Senegal: 2 ♂, 3 ♀, Sedhiou, 17–25.vii.1917 (*Castell*) (BMNH); 1 ♂, Thiés, vi.1907 (*Riggenbach*) (BMNH). **Ivory Coast**: 2 ♂, 1 ♀, Bingerville, 5–20.vii.1915 (*Melou*) (BMNH). **Nigeria**: 1 ♀, Badeggi, on *Oryza sativa*, 3.vii.1965 (BMNH); 2 ♂, 2 ♀, Lagos, 17–23.vii.1906 (*Boag*) (BMNH). **Zaire**: 1 ♂, Lubumbashi (Elisabethville), 10.ii.1934 (*Seydel*) (BMNH). **Tanzania**: 2 ♂, Shinyanga, 20.v.1952, 12.v.1954 (*Burtt*) (BMNH). **Angola**: 1 ♂, Mt Moco, Luimbale, 1800–1900 m, 13.iii.1934 (*Jordan*) (BMNH). **Mozambique**: 1 ♀, E. of Mt Chiperone, 2200 ft [660 m], 25.xi.1913 (*Neave*) (BMNH); 1 ♂, Beira, 6.v.1967 (*Jacobs*) (BMNH). **South Africa**: 1 ♂, Port St Johns, Pondoland, x.1923 (*Turner*) (BMNH). **Madagascar**: 8 ♂, Nanisana, xii.1913–i.1932 (*Olsoufieff*) (BMNH); 4 ♂, Parinet, 149 km E. of Tananarivo (*Olsoufieff*) (BMNH); 1 ♂, Mananjary (BMNH); 2 ♂, Diego Suarez, 19.ii.1917 (Melou) (BMNH). **Malawi**: 1 ♂, Zomba, v.1895 (*Rendall*) (BMNH).

Scirpophaga fusciflua Hampson, 1893
(Figs 71, 72, 114, 164, 165, Map 10)

Scirpophaga fusciflua Hampson, 1893: 167, pl. 172, figs 29, 30; Common, 1960: 327. Holotype ♂, SRI LANKA: Pundaloya (*Green*) (BMNH, Pyralidae genitalia slide no. 5022) [examined].

[*Scirpophaga gilviberbis* Zeller; Hampson, 1895: 913. *Scirpophaga fusciflua* Hampson erroneously cited as synonym.]

♂ (Fig. 164). 16–22 mm. Pale ochreous white. Length of labial palpus approximately equal to diameter of compound eye. Forewing white to ochreous white, underside fuscous; hindwing white, underside with costal area suffused with pale fuscous.

♀ (Fig. 165). 21–27 mm. White. Fore- and hindwing white; frenulum single-bristled. Anal tuft greyish white or ochreous yellow.

GENITALIA ♂ (Figs 71, 72). Subteguminal process bilobed; anellus with dense, strong spines laterally.

GENITALIA ♀ (Fig. 114). Ductus bursae and ductus seminalis strongly sclerotized near ostium bursae; corpus bursae membranous, sometimes strongly wrinkled.

REMARKS. *S. fusciflua* appears to be very closely related to the two following species, *S. virginia* and *S. ochroleuca*. The male of *S. fusciflua* can be separated from *S. virginia* by having a bilobed subteguminal process and from *S. ochroleuca* by the relatively short uncus and gnathos and also the uniformly white forewing. No differences could be found in the females of these three species.

BIOLOGY. According to the label data of the material examined the host plant is *Oryza sativa* (Lucknow, India). This species has also been found in rice-fields in Sri Lanka.

DISTRIBUTION. Afghanistan, India, Sri Lanka, Nepal, Thailand, Taiwan.

MATERIAL EXAMINED

Afghanistan: 7 ♂, 7 ♀, Bashgul Valley, Nuristan, 1200 m, 3–21.v.1953 (*Klapperich*) (LN, Karlsruhe); 2 ♂, 2 ♀, 25 km N. of Barikot, Nuristan, 1800 m, 12–17.viii.1963 (*Kasy & Vartian*) (NM, Vienna). **India**: 1 ♀, Lucknow, on *Oryza sativa*, xii.1962 (BMNH); 1 ♂, Tezpur, Assam (BMNH). **Sri Lanka**: 1 ♀, Pundaloya (*Green*) (BMNH) (allotype of *Scirpophaga fusciflua* Hampson); 3 ♂, 1 ♀, Bandarwela, in rice-field, xii.1970 (BMNH); 1 ♂, no further data (BMNH). **Nepal**: 3 ♂, 3 ♀, Jiri, 2000 m, 10–13.viii.1964 (*Dierl*) (ZSBS, Munich); 1 ♂, Katmandu, 1600 m, 30.viii.1964 (*Dierl*) (ZSBS, Munich); 1 ♀, Katmandu, 19.vii.1962 (*Ebert & Falkner*) (ZSBS, Munich); 1 ♂, 2 ♀, Katmandu, 1400 m, 26–29.v.1967 (*Dierl & Schacht*) (ZSBS, Munich); 2 ♂, Katmandu, 4500 ft, 31.vii, 8.viii.1935 (*Bailey*) (BMNH); 1 ♂, Rapti Tal, Megouli, 300 m, 29.iii.–4.iv.1962 (*Ebert & Falkner*) (ZSBS, Munich); 1 ♀, Rapti Tal, Jhawani, 200 m, 15.v.1967 (*Dierl, Forster & Schacht*) (ZSBS, Munich). **Thailand**: 1 ♂, no further data (*Ladell*) (BMNH). **Taiwan**: 3 ♂, 18 ♀, Suishako, 1907 (BMNH).

Scirpophaga ochroleuca Meyrick, 1882
(Figs 73, 74, 115, 166, 167, Map 9)

Scirpophaga ochroleuca Meyrick, 1882: 162; Common, 1960: 326, fig. 7H, pl. 2, fig. 2. Lectotype ♀, [not ♂ as stated by Meyrick], AUSTRALIA: 'Coomooboolaroo, Queensland, GB/77' (BMNH, Pyralidae genitalia slide no. 4020), designated by Common (1960: 327) [examined].

♂ (Fig. 166). 15–18 mm. Pale ochreous. Length of labial palpus approximately 1·2 times diameter of compound eye. Forewing ochreous, underside fuscous; hindwing white with ochreous suffusion on costal half of both surfaces.

♀ (Fig. 167). 19–29 mm. White. Forewing with pale ochreous suffusion, underside white; hindwing white; frenulum single-bristled. Anal tuft pale ochreous white.

GENITALIA ♂ (Figs 73, 74). Gnathos long, slender, subteguminal process slightly bilobed.

GENITALIA ♀ (Fig. 115). As in *S. fusciflua*.

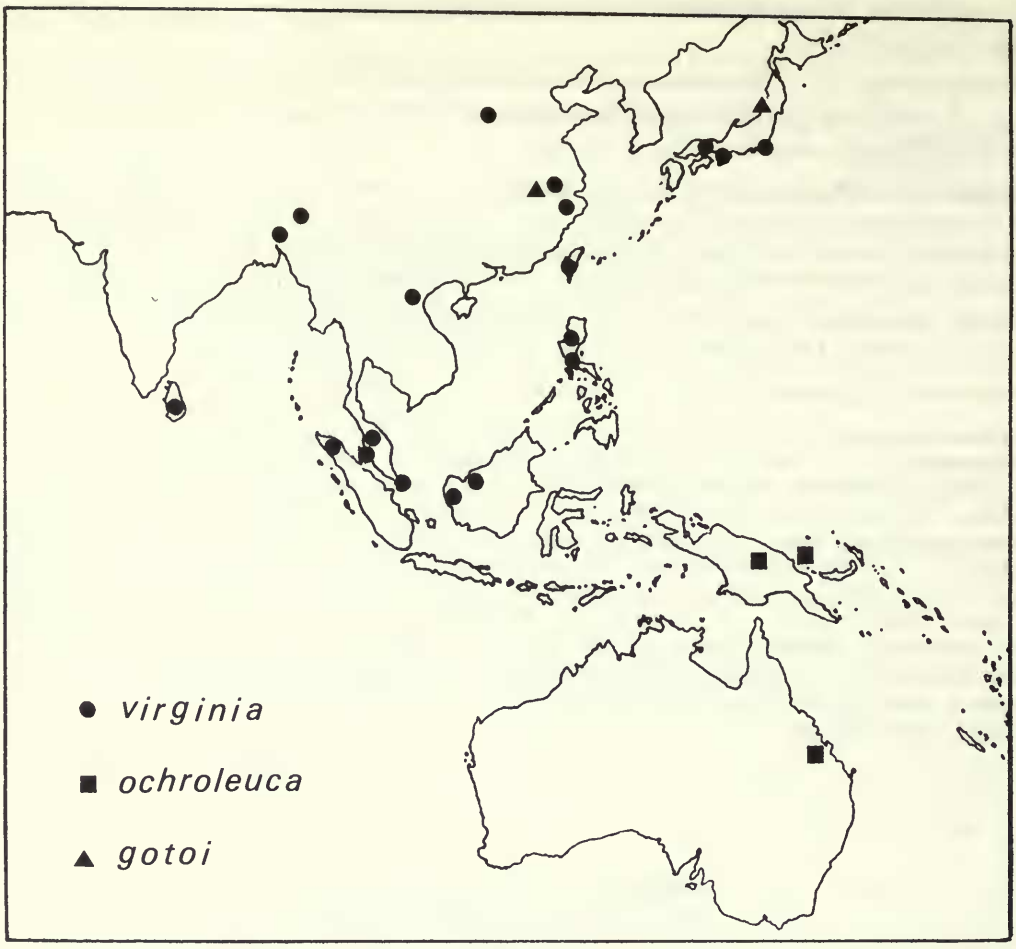
REMARKS. This species is very similar to *S. fusciflua*. The male of *S. ochroleuca* can be distinguished from that species by the ochreous forewings and the long gnathos. In the female, the forewing is always suffused with pale ochreous, and the anal tuft is ochreous white.

BIOLOGY. Unknown.

DISTRIBUTION. Australia, New Guinea.

MATERIAL EXAMINED

Australia: 1 ♀ (not ♂ as stated by Meyrick, 1882 and Common, 1960), same data as lectotype (BMNH, abdomen missing) (paralectotype of *Scirpophaga ochroleuca* Meyrick). **New Guinea**: 1 ♂, 34 ♀, Padwe, Sepik R., 26.x.1957 (*Monroe & Holland*) (CNC, Ottawa); 1 ♂, 1 ♀, Dampier I., 11.iii.1914 (*Meek*) (BMNH).



Map 9

Scirpophaga virginia Schultze, 1908
(Figs 75, 76, 116, 168, 169, Map 9)

Scirpophaga virginia Schultze, 1908: 34. NEOTYPE ♂, PHILIPPINES: Manila, Luzon, 17.i.1913 (*A. E. Wileman*) (BMNH, Pyralidae genitalia slide no. 13465), here designated [examined].

♂ (Fig. 168). 13–17 mm. As in *S. fusciflua* but generally smaller.
♀ (Fig. 169). 16–22 mm. As in *S. fusciflua*. Anal tuft greyish white.

GENITALIA ♂ (Figs 75, 76). As in *S. fusciflua*, but subteguminal process rounded.

GENITALIA ♀ (Fig. 116). As in *S. fusciflua*.

REMARKS. Because of the great similarity between the species in this group, *S. virginia* cannot be recognized with certainty from Schultze's description. It is therefore necessary in the interest of stability of nomenclature to base the identity of *S. virginia* on a neotype.

As mentioned by Schultze (1908: 34), the type-material (holotype ♂ and allotype ♀) was deposited in the Entomological Collection Bureau of Science, Manila, Philippines, where it was destroyed during the Second World War. According to a letter from Miss Clare R. Baltazar, of the same institution, to Dr P. E. S. Whalley (BMNH) ". . .not a single insect specimen in our insect museum was saved during the war; there was a complete destruction of the building. . .".

The species here interpreted as *S. virginia* agrees with Schultze's description. This species is smaller on average than the other species in this group. According to the original description the types were small specimens. The length of the forewing of the holotype was 7·5 mm, which is the same as the length of the forewing in the neotype.

S. virginia was originally collected in Manila in September and October, 1905. The specimen here proposed as the neotype was collected from the same locality in January, 1913.

This species is very close to *S. fusciflua*, the only difference being in the subteguminal process of the male genitalia, which is rounded in this species instead of bilobed as in *S. fusciflua*. No difference was found in the females of these two species.

BIOLOGY. According to the label data of the material examined the host plant is *Oryza sativa* (Dacca, Bangladesh).

DISTRIBUTION. Sri Lanka, Bangladesh, Thailand, West Malaysia, Singapore, Borneo, Sumatra, Philippines, Vietnam, China, Taiwan, Japan.

MATERIAL EXAMINED

Sri Lanka: 3 ♂, no further data (BMNH). **Bangladesh**: 1 ♂, 1 ♀, Dacca, on *Oryza sativa*, 1964 (BMNH); 1 ♂, Chhatak, Sylhet Dist. (*Ewing*) (BMNH). **Thailand**: 2 ♂, 2 ♀, Patalung, at light, 21, 29.iv.1924 (*Evans*) (BMNH). **West Malaysia**: 1 ♂, 1 ♀, Penang, v.1904 (UM, Oxford). **Singapore**: 1 ♂, iii.1905 (*Jones*) (BMNH). **Borneo**: 1 ♂, Pontianak (*Andre*) (BMNH); 2 ♂, 3 ♀, no further data (BMNH). **Sumatra**: 1 ♂, 1 ♀, Tibis, Tinggi, 14.ii–3.iii.1963 (*Diehl*) (BMNH). **Philippines**: 3 ♀, Manila, iii.1913 (*Wileman*) (BMNH); 1 ♂, Los Banos (NMNH, Washington); 1 ♂, 1 ♀, Mt Makiling, Luzon (*Baker*) (NMNH, Washington). **Vietnam**: 1 ♂, Hanoi, 15.x.1923 (*Stevens*) (BMNH). **China**: 5 ♂, 4 ♀, Lungtan, nr Nanking, Kiangsu, 13.vi–27.vii.1933 (*Höne*) (LN, Karlsruhe); 1 ♂, Hoengshan, Hunan, 19.v.1933 (*Höne*) (LN, Karlsruhe); 2 ♂, 2 ♀, Taishan, Shantung, 1550 m, 4.viii–12.ix.1934 (*Höne*) (LN, Karlsruhe). **Taiwan**: 2 ♂, 2 ♀, Takow, 7.viii–4.ix.1904 (*Wileman*) (BMNH). **Japan**: 1 ♂, Ikada, Osaka, 5.vii.1951 (*Mutuura*) (CNC, Ottawa); 4 ♂, 2 ♀, Sakai, Osaka, 12.vii–3.viii.1948, 9.vii–28.viii.1949 (*Mutuura*) (CNC, Ottawa); 1 ♂, Hieisan, Kyoto, 24.vii.1948 (*Mutuura*) (CNC, Ottawa); 1 ♂, 2 ♀, Sakaisi, Honshu, 26.vi.1954 (*Mutuura*) (CNC, Ottawa); 1 ♂, Miyamamuka, 29.vii.1948 (*Mutuura*) (CNC, Ottawa); 2 ♂, 5 ♀, Yokohama (*Höne*) (LN, Karlsruhe); 1 ♂, Yokohama, ix.1911 (BMNH).

Scirpophaga subumbrosa Meyrick, 1933
(Figs 77, 78, 117, 170, 171, Map 12)

Scirpophaga subumbrosa Meyrick, 1933: 376. Holotype ♂, ZAIRE: Kitobola, 1911 (*Rovere*) (MRAC, Tervuren) [examined].

♂ (Fig. 170). 22–28 mm. Pale ochreous white. Length of labial palpus approximately 2 times diameter of compound eye. Forewing with colour varying from pale ochreous white to pale ochreous, underside fuscous; hindwing pale ochreous white on both surfaces, costal area suffused with ochreous, stronger on underside.

♀ (Fig. 171). 28–40 mm. White. Fore- and hindwing white on both surfaces; frenulum double-bristled. Anal tuft pale ochreous yellow.

GENITALIA ♂ (Figs 77, 78). Valva relatively narrow, costal and ventral margin more or less parallel; anellus with dense, strong spines.

GENITALIA ♀ (Fig. 117). Ductus bursae lined with spines on one side; corpus bursae with dense spines.

REMARKS. The whitish forewings of the male of *S. subumbrosa* distinguish it from *S. marginepunctella,* which has ochreous forewings with markings. The genitalia of these two species are very similar in having the anellus covered with strong spines, but the valva of *S. subumbrosa* is narrower distally. In the female genitalia, this species differs from others in the *occidentella*-group in having the corpus bursae densely lined with spines.

BIOLOGY. According to the label data of the material examined the host-plant is *Oryza sativa* (Nigeria, Sierra Leone).

DISTRIBUTION. Senegal, Sierra Leone, Ghana, Nigeria, Sudan, Ethiopia, Zaire, Tanzania, Zambia, Malawi, Mozambique, Madagascar.

MATERIAL EXAMINED

Senegal: 4 ♂, 1 ♀, Sedhiou, 3–8.vii.1917 (*Castell*) (BMNH). **Sierra Leone**: 1 ♀, Mange, on *Oryza sativa*, 24.ix.1964 (*Jordan*) (BMNH). **Ghana**: 1 ♂, 1 ♀, Bolgatanga, iv.1962 (*Lewis*) (BMNH); 1 ♀, Kete Krachi (*Cardinall*) (BMNH); 1 ♂, 1 ♀, Navaro, vii.1923 (*Cardinall*) (BMNH). **Nigeria**: 3 ♂, Abinsi, 5.v.1912 (BMNH); 7 ♂, 8 ♀, Badeggi, on *Oryza sativa*, 23.vii–3.viii.1965 (BMNH); 4 ♀, Badeggi, on *Oryza sativa* (BMNH); 1 ♂, 2 ♀, Lokoja, x.1904 (*Cator*) (BMNH); 1 ♂, 1 ♀, Warri, vi.1897 (*Roth*) (BMNH); 1 ♂, 2 ♀, Zungeru, 28.x.1910–15.v.1911 (*Macfie*) (BMNH); 1 ♂, 1 ♀, Agberi, 26.vii.–9.viii.1901 (*Ansorge*) (BMNH). **Sudan**: 2 ♂, White Nile, 511–520 m, S. of Khartoum, 12.x.1918 (*Wilson*) (UM, Oxford). **Ethiopia**:1 ♂, Ogotok, 13.v.1904 (*Zaphiro*) (BMNH). **Zaire**: 1 ♂, Kitobola, 1911 (*Rovere*) (BMNH) (paratype of *Scirpophaga subumbrosa* Meyrick); 2 ♂, 1 ♀, Katanga, xi.1926–ii.1927 (BMNH); 2 ♂, Lulua, 10.iv.1932 (BMNH). **Tanzania**: 1 ♂, 1 ♀, Mbamba Bay, 12–16.iv.1936 (*Zerny*) (NM, Vienna). **Zambia**: 1 ♀, Luangwa, 1800–2000 ft [540–600 m], 5.iii.1908 (UM, Oxford). **Malawi**: 1 ♀, Mlanje, 6500 ft [1970 m], 5.x.1913 (*Neave*) (BMNH); 3 ♂, 1 ♀, SW. of Lake Chilwa, 11.i.1914 (*Neave*) (BMNH). **Mozambique**: 1 ♂, E. of Mt Chiperone, 2200 ft [660 m], 26.xi.1913 (*Neave*) (BMNH); 1 ♂, Chinde, 4.viii.1899 (*Jersey*) (BMNH). **Madagascar**: 6 ♂, 2 ♀, Sambirano (MNHN, Paris); 4 ♂, no further data (MNHN, Paris).

Scirpophaga marginepunctella (de Joannis, 1927) **comb. n.**

(Figs 79, 80, 118, 172, 173, Map 13)

Schoenobius marginepunctellus de Joannis, 1927: 189, pl. 8, fig. 6. Holotype ♂, MOZAMBIQUE: Makulane, x.–xii.1907, Coll. Dr. G. Audéoud (MHN, Geneva) [examined].

♂ (Fig. 172). 25–30 mm. Ochreous. Length of labial palpus approximately 2·6 times diameter of compound eye. Forewing ochreous, markings as in male of *S. nivella*, underside fuscous; hindwing white, costal area suffused with pale fuscous on both surfaces.

♀ (Fig. 173). 36–44 mm. White. Forewing usually suffused with very pale ochreous white on upperside, hindwing white; frenulum double-bristled. Anal tuft ochreous yellow.

GENITALIA ♂ (Figs 79, 80). Valva broad distally; anellus with dense spines.

GENITALIA ♀ (Fig. 118). Corpus bursae membranous, sparsely lined with minute spines in basal half.

REMARKS. The male of this species is similar to the male of *S. nivella* externally, but the labial palpus of *S. marginepunctella* is much longer. *S. marginepunctella* is found only in Africa while *S. nivella* is Australasian. The genitalia are similar to those of *S. subumbrosa*, the diagnostic difference being the width of the valva which is broader distally in *S. marginepunctella*. Externally these two species are quite distinct. *S. marginepunctella* has ochreous forewings with markings while *S. subumbrosa* has plain whitish forewings.

The female of *S. marginepunctella* can be distinguished from the other white Afrcian species by the ochreous yellow anal tuft and the double-bristled frenulum. The genitalia have a membranous corpus bursae with very few spines, similar to that of *S. serena*, but the ostium bursae lacks the longitudinal wrinkling towards the ductus bursae found in *S. serena*.

BIOLOGY. Unknown.

DISTRIBUTION. Senegal, Nigeria, Sudan, Zaire, Angola, Botswana, Mozambique, Madagascar.

MATERIAL EXAMINED

Senegal: 1 ♀, Sedhiou, 5–12.vii.1917 (*Castell*) (BMNH). **Nigeria**: 1 ♀, Lokoja, x.1904 (*Cator*) (BMNH). **Sudan**: 1 ♂, 1 ♀, White Nile, 511–520 m S. of Khartoum, 12.x.1918 (*Wilson*) (UM, Oxford); 1 ♂, 2 ♀, White Nile, Khor et 'Atash, 7.ii.1912 (*Longstaff*) (BMNH); 3 ♀, Mongalla, 20.x.1917 (*Yardley*) (BMNH); 1 ♀, Wau, 6.ii.1912 (*Longstaff*) (BMNH). **Zaire:** 1 ♀, Ankoro, 6.iii.1926 (BMNH); 1 ♀, Lualaba R. nr Mayumba, 14.viii.1931 (*Cockerell* (BMNH); 1 ♂, Lulua, 10.iv.1932 (BMNH); 1 ♀, Katanga, x.1930 (BMNH); 1 ♀, no further data (BMNH). **Angola**: 1 ♀, Boma, x.1903 (*Christy*) (BMNH). **Botswana**: 3 ♂, Chobe, at black light, 20.ii.1970 (*Ingram*) (BMNH). **Mozambique**: 1 ♂, same data as holotype (MHN, Geneva) [this specimen was misidentified as ♀ and erroneously designated as 'allotype' by de Joannis]; 1 ♂, Beira, 12.v.1907 (MNHN, Paris) [abdomen missing] (both paratypes of *Scirpophaga marginepunctella* de Joannis); 1 ♀, Makulane, x.–xi.1907 (MNHN, Paris). **Madagascar**: 2 ♂, Sambirano (MNHN, Paris) (paratypes) [one specimen was misidentified as ♀ by de Joannis]; 1 ♀, Manangara, xi.1918 (*Le Moult*) (BMNH); 1 ♂, Maroantsetra, iv.1952 (MNHN, Paris); 1 ♂, 1 ♀, Sambirano (MNHN, Paris); 1 ♀, Sambirano, 16, 17.xii.1963 (*Viette & Soga*) (MNHN, Paris); 1 ♂, no further data (MNHN, Paris).

Scirpophaga serena (Meyrick, 1935) **comb. n.**
(Figs 81, 82, 119, 174, 175, Map 14)

Schoenobius serenus Meyrick, 1935: 554. Holotype ♀, ZAIRE: Lulua, Kafakumba, iv.1932 (*F. G. Overlaet*) (MRAC, Tervuren) [examined].

♂ (Fig. 174). 30–35 mm. Dark ochreous. Length of labial palpus approximately 3 times diameter of compound eye. Forewing dark ochreous, markings as in *S. marginepunctella*; hindwing suffused with fuscous on distal half.

♀ (Fig. 175). 46–53 mm. Head and palpi pale ochreous white. Forewing with costal margin pale ochreous white, the rest varying from pale ochreous to ochreous, underside suffused with pale fuscous; hindwing white; frenulum double-bristled. Anal tuft ochreous yellow.

GENITALIA ♂ (Figs 81, 82). Subteguminal process large, lobe-like; anellus with dense, strong spines laterally; valva relatively long and narrow.

GENITALIA ♀ (Fig. 119). Ostium bursae broad, membranous, with longitudinal wrinkles towards ductus bursae; corpus bursae membranous.

REMARKS. In Africa, the male of *S. serena* can be confused only with *S. marginepunctella* externally, but the colour of *S. serena* in general is darker and the size is larger. With regard to the genitalia, the shape of the subteguminal process, the long valva and the dense spines on both sides of the anellus are characteristic of *S. serena*. The female genitalia are very similar to those of *S. marginepunctella,* but the longitudinal wrinkles in the ostium bursae towards the ductus bursae, which are absent in *S. marginepunctella,* are characteristic of *S. serena*.

BIOLOGY. Unknown.

DISTRIBUTION. Zaire, Angola.

MATERIAL EXAMINED

Zaire: 1 ♂, Lubumbashi (Elisabethville), 25.xi.1936 (*Seydel*) (MRAC, Tervuren); 1 ♂, Kafakumba, ix.1932 (*Overlaet*) (MRAC, Tervuren); 1 ♀, Kafakumba, xii.1927 (BMNH); 1 ♂, Katanga, xii.1928 (*Seydel*) (MRAC, Tervuren); 1 ♀, Kapanga, vii.1933 (*Overlaet*) (MRAC, Tervuren); 2 ♂, Sandoa, 24.i.1919, ii.1931 (*Overlaet*) (MRAC, Tervuren); 2 ♂, Sandoa, 30.x., 14.xi.1920 (BMNH); 2 ♂, Lulua, xi.1930, i.1931 (*Overlaet*) (BMNH). **Angola**: 2 ♀, Upper Cubango-Cunene, 550 ft [160 m], xi.1928 (*Barns*) (BMNH).

Scirpophaga goliath Marion & Viette, 1953
(Figs 120, 176, Map 14)

Scirpophaga goliath Marion & Viette, 1953: 39, fig. 1. Holotype ♀, MADAGASCAR: Tananarive, Parc de Tsimbazaza, 1200 m, 14.i.1952 (*Viette*) (MNHN, Paris) [not examined].

♂. Unknown.

♀ (Fig. 176). 46–52 mm. Head and palpi ochreous white. Forewing fuscous, costal area pale ochreous white, underside fuscous; hindwing white; frenulum double-bristled. Anal tuft ochreous yellow.

GENITALIA ♀ (Fig. 120). As in *S. serena*.

REMARKS. The female genitalia of this species are similar to those of *S. serena,* and the length of the wing expanse is also about the same. The only difference observed is in the forewing, which is narrower and fuscous in *S. goliath* but ochreous and slightly broader in *S. serena*. The pale ochreous white suffusion on the costal area extends from the base of the wing to the apex of R_2 in *S. serena,* and to R_3 in *S. goliath*. When the male is known, it is possible that *S. goliath* may prove to be conspecific with *S. serena*, since in this group colour is often variable. On the other hand it may be a good species because in the *occidentella*-group it has been found that the female genitalia of two species may be similar. At present *S. goliath* is considered to be distinct from *S. serena*.

BIOLOGY. Unknown.

DISTRIBUTION. Madagascar.

MATERIAL EXAMINED

Madagascar: 1 ♀, Plateaux de l'Imerina, Tananarive, Parc de Tsimbazaza, 1200 m, 19.i.1952 (*P. Viette*) (BMNH, Pyralidae genitalia slide no. 12907) (paratype of *Scirpophaga goliath* Marion & Viette); 1 ♀, Belroka, 17.ii.1955 (*Diehl*) (BMNH).

The *lineata*-group

Labial palpus long with spreading scales. Forewing with vein R_1 anastomosed with *Sc*. Frenulum in both sexes single-bristled.

GENITALIA ♂. Uncus and gnathos relatively short, strongly curved towards each other at apices; tegumen with dorsal sclerotized thickening somewhat triangular; subteguminal process strongly sclerotized, plate-like, originating very close to appendices angulares; valva not strongly sclerotized; manica with uniformly arranged minute spines; aedeagus slender, more or less uniform in diameter, vesica with minute spines.

GENITALIA ♀. Ostium bursae relatively broad, membranous; ductus bursae membranous, section between ostium bursae and ductus seminalis constricted, lined with sclerotized plate, U-shaped in cross section; ductus seminalis arising from ductus bursae closer to ostium bursae than corpus bursae; corpus bursae with dense spines; papillae anales wrinkled and leathery near tip.

The *lineata*-group consists of three species, *S. lineata, S. aurivena* and *S. auristrigella*. The group has the plate-like subteguminal process in the male genitalia similar to those of the *praelata*-group but the position of origin is different. In the *lineata*-group, the subteguminal process originates at a point very near to the appendices angulares where the valva attaches to the tegumen, while in the *praelata*-group, the base of the subteguminal process is broad and the valva is more sclerotized than that in the *lineata*-group. The aedeagus is also different; in the *praelata*-group cornuti are present, while in the *lineata*-group they are absent.

In the females the apex of the papillae anales is wrinkled and leathery near the tip, which is a characteristic of this species-group.

Key to species of the *lineata*-group

Males

1 Forewing white, with markings forming a pattern (Fig. 177) . . . . . ***lineata*** (p. 240)
– Forewing pale yellow, without markings, sometimes with one dark fuscous spot 2
2 Forewing without spot; subteguminal process with pointed apex, or truncate (Fig. 85) ***aurivena*** (p. 242)
– Forewing with one dark fuscous spot; subteguminal process with posterior margin produced to form a spine (Fig. 87). . . . . ***auristrigella*** (p. 242)

Females

Only the female of *S. lineata* is known.

Scirpophaga lineata (Butler, 1879) **comb. n.**
(Figs 83, 84, 123, 177, 178, Map 10)

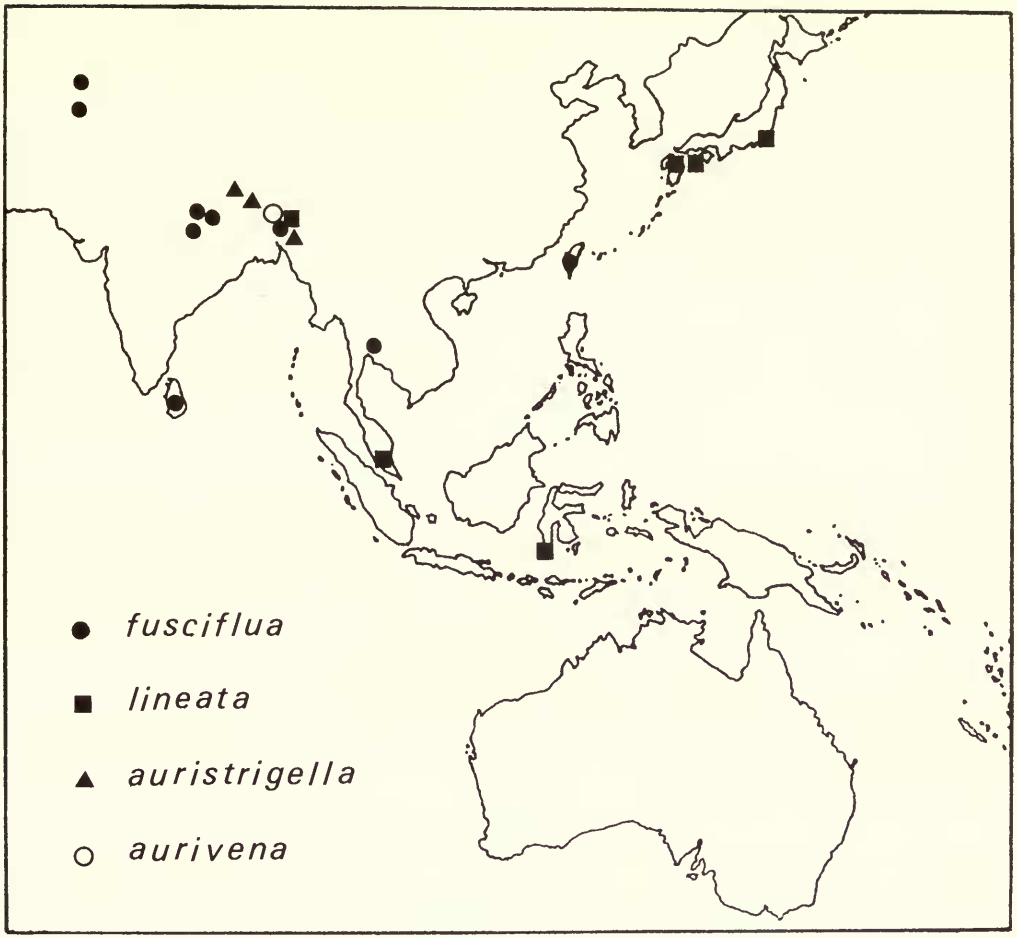
Apurima lineata Butler, 1879: 457. Holotype ♀, JAPAN: [Yokohama] (BMNH, Pyralidae genitalia slide no. 6329) [examined].

Schoenobius lineatus (Butler) Hampson, 1895: 917; Leech, 1901: 402; Marumo, 1934: 2, 21, pl. 1, fig. 7, pl. 2, fig. 6, pl. 3, fig. 6.

♂ (Fig. 177). 18–23 mm. White. Labial palpus with expanding scales, in length approximately 3–4 times diameter of compound eye. Forewing white, interspaces of veins suffused with light brown, an oblique light brown band from apex to middle of ventral margin, a dark fuscous spot at lower angle of cell, underside fuscous; hindwing white.

♀ (Fig. 178). 22–26 mm. Coloration and markings as in male. Frenulum single-bristled. Anal tuft white.

GENITALIA ♂ (Figs 83, 84). Subteguminal process strongly sclerotized, truncate and plate-like; valva narrow apically; aedeagus slender, vesica with minute spines.



Map 10

GENITALIA ♀ (Fig. 123). Ostium bursae relatively broad, membranous; ductus bursae membranous, section near ostium bursae constricted, lined with sclerotized plates; ductus seminalis arising from ductus bursae closer to ostium bursae than to corpus bursae; corpus bursae with dense spines; papillae anales wrinkled and slightly sclerotized near tip.

REMARKS. The male genitalia of this species are very similar to those of *S. aurivena* and *S. auristrigella,* especially the former with regard to the shape of the subteguminal process. The female genitalia are also similar to those of the other two species. In both sexes of *S. lineata,* the white forewing with markings connot be confused with the plain forewings (sometimes with a spot) of *S. aurivena* and *S. auristrigella.*

BIOLOGY. The host-plant is *Oryza sativa* in Japan (Marumo, 1934: 2, 3).

DISTRIBUTION. Japan, India, West Malaysia, Sulawesi.

MATERIAL EXAMINED

Japan: 1 ♂, 3 ♀, Yokohama, 22-24.vii.1898 (*Wileman*) (BMNH); 2 ♂, Yokohama, 14.vi., vii.1910 (*Höne*) (LN, Karlsruhe); 1 ♂, Yoshino, 10.vii.1899 (*Wileman*) (BMNH); 2 ♀, Yoshino, vii.1900 (*Wileman*) (BMNH); 1 ♂, 1 ♀, Hikosan, 5,7.viii.1954 (*Kuroko*) (CNC, Ottawa); 1 ♀, Inunakisan, Osaka, 3.ix.1956 (*Mutuura*) (CNC, Ottawa). **India**: 2 ♀, Khasis, Shillong, 5000 ft [1500 m], 29.vi., 1.vii.1928 (*Fletcher*) (BMNH). **West Malaysia**: 1 ♀, Selangor, Buki Kutu, 3500 ft [1050 m], at light, 14.iv.1926 (*Pendlebury*) (BMNH). **Sulawesi**: 1 ♀, Tjamba nr Maros, 1500 ft [450 m], ii.1938 (*Kalis*) (BMNH).

Scirpophaga aurivena (Hampson, 1903) **comb. n.**
(Figs 85, 86, 179, Map 10)

Schoenobius aurivena Hampson, 1903: 20. Holotype ♂, INDIA: Khasis [Khasi Hills], (BMNH, Pyralidae genitalia slide no. 13475) [examined].

♂ (Fig. 179). 19–22 mm. Pale yellow. Labial palpus suffused with yellow externally, in length approximately 3 times diameter of compound eye. Forewing pale yellow, interspaces of veins yellow, underside fuscous; hindwing white.

♀. Unknown.

GENITALIA ♂ (Figs 85, 86). Very similar to those of *S. lineata*. In the holotype, the subteguminal process has a pointed apex and is quite distinct from that of *S. lineata*, but variation occurs in the other specimens, the subteguminal process in them being somewhat truncate as in *S. lineata*.

REMARKS. This species is very similar to *S. auristrigella* externally, but in *S. aurivena* the forewing is without the spot which is usually present in *S. auristrigella*.

Three females from Khasi Hills are similar externally to the males of *S. aurivena* and *S. auristrigella;* however, at present it is not possible to match the sexes and breeding experiments are needed to associate them. The genitalia of these three females are very similar to those of *S. lineata*.

BIOLOGY. Unknown.

DISTRIBUTION. India.

MATERIAL EXAMINED

India: 3 ♂, Khasi Hills, vi.,x.1894 (BMNH).

Scirpophaga auristrigella (Hampson, 1895) **comb. n.**
(Figs 87, 88, 180, Map 10)

Schoenobius auristrigellus Hampson, 1895: 916; 1896: 49. Holotype ♂, BHUTAN: 28.vi.1895 (*Dudgeon*) (BMNH, Pyralidae genitalia slide no. 13474) [examined].

♂ (Fig. 180). 20–26 mm. Similar to *S. aurivena* but forewing usually with a dark fuscous spot at lower angle of cell. In the holotype, forewing with oblique yellow line from the apex to the middle of the ventral margin. This line is absent in some specimens and in others it is present along subterminal margin.

♀. Unknown.

GENITALIA ♂ (Figs 87, 88). Similar to *S. lineata* and *S. aurivena* but subteguminal process with posterior margin produced to form a spine.

REMARKS. Very similar to *S. aurivena* but the forewing usually has a dark fuscous spot. In the male genitalia, the posterior margin of the subteguminal process, produced to form a spine, is characteristic of this species.

BIOLOGY. Unknown.

DISTRIBUTION. India, Bhutan.

MATERIAL EXAMINED

India: 15 ♂, Khasi Hills, v.–viii.1894 (BMNH); 2 ♂, Khasi Hills (UM, Oxford); 1 ♂, Cherra[pungji], Assam (BMNH); 1 ♂, Sikkim, 17.vii.1889 (*Pilcher*) (BMNH).

The *incertulas*-group

Forewing with vein R_1 curved towards *Sc*, sometimes coincident with it. Frenulum in male a single bristle, in female with single or double bristles.

GENITALIA ♂. Uncus and gnathos moderately long and slender; tegumen with sclerotized thickening somewhat triangular; subteguminal process spine-like; aedeagus slender, vesica with minute spines, two adjacent unequal curved spined, cornuti present.

GENITALIA ♀. Ostium bursae broad, membranous, wrinkled with small spines; ductus bursae membranous; ductus seminalis arising near ostium bursae; corpus bursae lined with spines in basal three-quarters.

The *incertulas*-group consists of two economically important species, *S. incertulas* and *S. innotata*. Both of them are very serious pests of rice in Asia and were considered by Common (1960) to be in a separate genus, *Tryporyza*, which in this study is considered to be a synonym of *Scirpophaga* (see p. 196).

Key to species of the *incertulas*-group

Males

1 Forewing ochreous, with markings; subteguminal process a bifid spine (Fig. 89) ***incertulas*** (p. 243)
– Forewing white or pale ochreous white, without markings; subteguminal process a single curved spine (Fig. 91). . . . . ***innotata*** (p. 246)

Females

1 Forewing pale yellow with one dark fuscous spot at lower angle of cell; ostium bursae strongly wrinkled, lined with minute spines; corpus bursae with dense spines in basal three-quarters (Fig. 121) . . . . . ***incertulas*** (p. 243)
– Forewing white without spot; genitalia as above (Fig. 122) . . . . . ***innotata*** (p. 246)

Scirpophaga incertulas (Walker, 1863) **comb. n.**

(Figs 89, 90, 121, 181, 182, Map 11)

Chilo incertulas Walker, 1863*a*: 143. Holotype ♂, BORNEO: Sarawak, Saunders' Coll. (BMNH, Pyralidae genitalia slide no. 2463) [examined].

Catagela ?admotella Walker, 1863*a*: 192. Holotype ♂, SRI LANKA: [Colombo, x.1857 (*Nietner*)] (BMNH, Pyralidae genitalia slide no. 2465) [examined]. [Synonymized with *incertulas* Walker by Hampson, 1895: 916.]

Schoenobius punctellus Zeller, 1863: 4. LECTOTYPE ♀, JAVA: 'Java Tengstr.' (BMNH, Pyralidae genitalia slide no. 6346), here designated [examined]. [Synonymized with *incertulas* Walker by Shiraki, 1917: 2.]

Schoenobius minutellus Zeller, 1863: 5. LECTOTYPE ♂, JAVA: 'Java, Tengstr.' (BMNH, Pyralidae genitalia slide no. 11067) here designated [examined]. [Synonymized with *incertulas* Walker by Hampson, 1895: 916.]

Tipanaea bipunctifera Walker, 1863*b*: 523. Holotype ♀ [not ♂ as stated by Walker], BORNEO: Saunders' Coll. (BMNH, Pyralidae genitalia slide no. 6296) [examined]. [Synonymized with *incertulas* Walker by Shiraki, 1917: 2.]

Chilo gratiosellus Walker, 1864: 967. LECTOTYPE ♀, SRI LANKA: 'Ceylon' [Colombo, x.1857 (*Nietner*)] (BMNH, Pyralidae genitalia slide no. 13473), here designated [examined]. [Synonymized with *incertulas* Walker by Shiraki, 1917: 2.]

[*Chilo*] *incertellus* Walker; Walker, 1864: 1069.

Apurima gratiosella (Walker) Butler, 1880: 690.

Schoenobius bipunctifera (Walker) Moore, 1886: 385, pl. 184, fig. 13; Leech, 1901: 403.

Catagela admotella Walker; Moore, 1886: 386.

Schoenobius bipunctiferus (Walker); Hampson, 1895: 915.

Schoenobius incertulas (Walker) Hampson, 1895: 916; 1896: 48; Jepson, 1954: 9, pl. 1; Martin, 1958: 187, figs 3, 7, pl. 6, figs 2, 3.

Schoenobius bipunctifer (Walker); Hampson, 1896: 48; Strand, 1918: 262.

Schoenobius incertellus (Walker); Shiraki, 1917: 1–256, pls 1–22; Fletcher, 1932: 276; Shibuya, 1928: 63, pl. 4, figs 18, 25; de Joannis, 1929: 609; Marumo, 1934: 18, pl. 1, figs 8, 9, pl. 2, figs 1–3, 5, pl. 3, fig. 10, pl. 4, fig. 5, pl. 5, figs 1–5.

Schoenobius bipunctifer ab. *quadripunctellifera* Strand, 1918: 263.

Tryporyza incertulas (Walker) Common, 1960: 341; Kapur, 1967: 6, 23.

♂ (Fig. 181). 20–24 mm. Ochreous. Length of labial palpus approximately 3 times diameter of compound eye. Forewing ochreous, markings as in *S. nivella*, underside fuscous; hindwing white with ochreous suffusion in costal half.

♀ (Fig. 182). 23–33 mm. Pale yellow. Labial palpus pale yellowish ochreous. Forewing yellowish ochreous with one dark fuscous spot at the lower angle of the cell; hindwing white with yellowish ochreous suffusion in costal half; frenulum double-bristled. Anal tuft pale ochreous white.

GENITALIA ♂ (Figs 89, 90). Uncus and gnathos long, slender; tegumen with dorsal sclerotized thickening somewhat triangular in shape; subteguminal process a bifid spine; aedeagus slender, vesica with small spines, two adjacent unequal curved spined cornuti present.

GENITALIA ♀ (Fig. 121). Ostium bursae membranous, strongly wrinkled; lined with minute spines; corpus bursae with spines in the basal three-quarters.

REMARKS. The name '*incertellus*' was mentioned first in the index to Walker's catalogue (vol. 30, 1864: 1069) referring to the page of the description for *incertulas* (vol. 27, 1863: 143). Fletcher (1923: 276), without giving any evidence, stated that *incertulas* was an error in manuscript or printing but corrected to *incertellus* in the index. Since *incertulas* has priority and there is no evidence of original misspelling, this name is used here.

The male of this species is similar externally to the male of *S. nivella,* especially in the forewing markings, but it can be distinguished by the longer labial palpus (about 3·0 times diameter of compound eye in *S. incertulas* and 1·3 times in *S. nivella*), and the forewing in *S. incertulas* is dull, not shining as in *S. nivella.*

The male genitalia of *S. incertulas* are very similar to those of *S. innotata,* but the subteguminal process of *S. incertulas* is a bifid spine while in *S. innotata* it is a single spine. No differences could be found in the female genitalia of these two species. Externally *S. incertulas* is quite different from *S. innotata* in both sexes.

BIOLOGY. According to the label data of the material examined, and published data, the host plant is *Oryza sativa.*

Shiraki (1917), when studying *S. incertulas* in Taiwan, tried to find the alternative host plants of this species. By checking the stems of 15 different plants in the field every month from 1909–1911, he could not find a single larva of *S. incertulas* feeding on them. The plants were *Miscanthus sinensis, Zizania latifolia, Panicum proliferum, Imperata arundinacea* var., *Erianthus* sp., *Eragrostis major, Ischaemum rugosum* var., *Paspalum scrobiculatum, Calamagrostis epigejos* var., *Scirpus mucronatus, Scirpus lacustris, Panicum repens,* sugar-cane, barley and teosinte.

Fletcher & Ghosh (1920) were of the opinion that the true *S. incertulas* had not been observed feeding on any plant other than rice. They criticized a report by Kasargode and Despande that *S. incertulas* is also found on *Coix lachryma, Ischoemum aristatum, Andropogon odoratus* and *Anthistiria ciliata* in India.

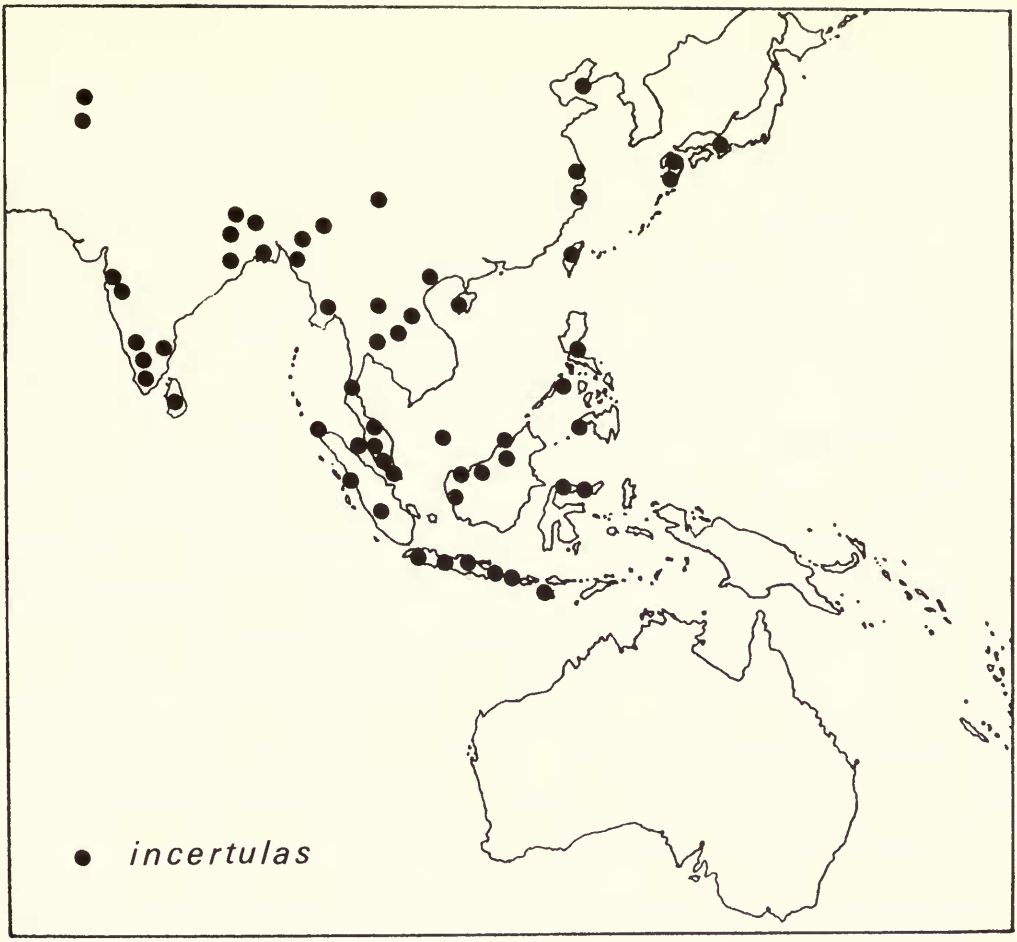
Box (1953) listed *Schoenobius bipunctifer* (a synonym of *S. incertulas*) as a pest of sugar-cane in India, Burma, Malaya, China and the Philippines. The occurrence of *S. incertulas* on sugar-cane is also supported by a label on a female specimen from an unknown locality, although it is possible that this specimen has the wrong label attached to it. Whether sugar-cane is an alternative host plant for *S. incertulas* remains unconfirmed and needs to be investigated by field work. Logothetis (1950) mentioned volunteer rice and many gramineous plants, especially wild *Cyperus,* as the host plants of *S. incertulas.*

The life history of *S. incertulas* has been studied by many authors. The fullest details were given by Shiraki (1917), who wrote a monograph concerning nearly all aspects of this species. Fletcher & Ghosh (1920) investigated the species in India, Kiritani & Iwao (1967) studied it in a temperate region, and Banerjee & Pramanik (1967) in the tropics. The life history of *S. incertulas* is also mentioned by Logothetis (1950) and Grist & Lever (1969).

DISTRIBUTION. Afghanistan, Nepal, India, Sri Lanka, Bangladesh, Burma, Vietnam, Thailand, West Malaysia, Singapore, Sumatra, Java, Borneo, Sumba, Sulawesi, Philippines, Taiwan, Hong Kong, China, Japan.

MATERIAL EXAMINED

Afghanistan: 1 ♂, 2 ♀, Sarobi, 1100 m, 10.v.–13.ix.1961 (*Ebert*) (ZSBS, Munich); 3 ♂, 2 ♀, Sarobi, 1100 m, 17.iv.–27.ix.1961 (*Ebert*) (LN, Karlsruhe). **Nepal**: 6 ♂, 3 ♀, Rapti Tal, Megouli, 300 m, 29.iii.–4.iv.1962 (*Ebert & Falkner*) (ZSBS, Munich); 1 ♂, Rapti Tal, Jhawani, 200 m, 16.v.1967 (*Dierl, Forster & Schacht*) (ZSBS, Munich); 1 ♂, Bhimpedi, 400 m, 4–7.iv.1962 (*Ebert & Falkner*) (ZSBS, Munich); 2 ♀, Thangpoche, 3980 m, 9.viii.1964 (*Löffler*) (ZSBS, Munich); 3 ♀, Katmandu, 1400 m, 27–29.v.1967 (*Dierl & Schacht*) (ZSBS, Munich); 1 ♀, Monahari, Khola, Belwa, 350 m, 10.v.1967 (*Dierl, Forster & Schacht*) (ZSBS, Munich). **India**: 2 ♂, Calcutta (BMNH) (paralectotypes of *Schoenobius minutellus* Zeller); 1 ♀, Assam, at



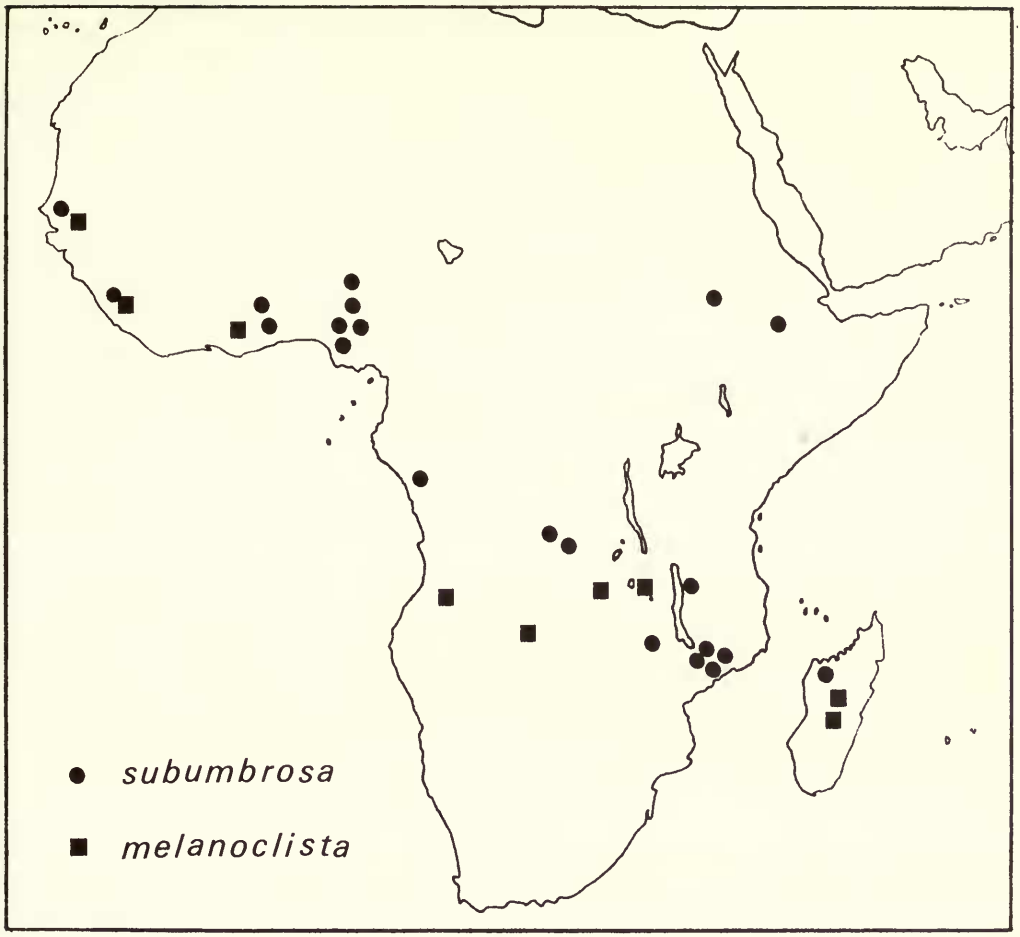
Map 11

rest on *Scirpus* sp., iii.1965 (BMNH); 2 ♂, Pusa, 30.iii.1927 (*Hassan*) (BMNH); 2 ♀, Pusa, at light, 9.viii.1926 (*Pillai*) (BMNH); 1 ♀, Pusa, 6.iii.1929 (*Fletcher*) (BMNH); 4 ♀, Malabar, Cochin, 23–27.xii.1941 (*Graham*) (BMNH); 4 ♀, Nilgiris Hills (BMNH); 7 ♀, Trichinopoly (*Castets*) (BMNH); 8 ♂, 15 ♀, Mahe (BMNH); 3 ♂, 5 ♀, Madras, xii.1896–iii.1897 (BMNH); 3 ♂, 10 ♀, Calcutta (BMNH); 1 ♂, 1 ♀, Bombay, viii.1890 (BMNH); 1 ♀, Bombay, x.1883 (BMNH); 1 ♀, Bombay (BMNH); 1 ♂, 1 ♀, Poona, xi.1882 (BMNH); 2 ♀, Tezpur, Assam (BMNH); 1 ♀, Assam (BMNH); 1 ♀, Uttamapalaiyam, 5000 ft [1500 m], xii.1932 (*Cantley*) (BMNH); 1 ♂, Palni (BMNH); 1 ♀, Belgaum, vii.1896 (BMNH); 1 ♀, Ganjam (BMNH). **Sri Lanka**: 2 ♀, Ceylon [Colombo, x.1857 (*Nietner*)] (BMNH) (paralectotypes of *Chilo gratiosellus* Walker); 4 ♀, Colombo, i.1896, vii.1901, viii.1908 (BMNH); 4 ♀, Colombo, 7.ii., 22.v., 16–17.vii.1945 (*Howord*) (BMNH); 1 ♀, Colombo, 24.xii.1907 (*Meade Waldo*) (BMNH); 1 ♀, Colombo (BMNH); 1 ♂, 8 ♀, Kandy, iv.1894, i.1902, iii.1904, ix.–xii.1907 (BMNH); 1 ♂, 1 ♀, Maskeliya (BMNH); 3 ♂, 3 ♀, Puttalam (BMNH); 2 ♂, Hambantola (BMNH); 1 ♀, Gampola, xii.1905 (BMNH); 2 ♂, 5 ♀, no further data (BMNH). **Bangladesh**: 1 ♀, Chittagong (BMNH); 1 ♀, Bengal, v.1894 (BMNH). **Burma**: 2 ♂, 1 ♀, Rangoon (BMNH); 1 ♂, Upper Chindwin Dist. (BMNH); 1 ♀, Momeit, 2000 ft [600 m], vi.1890 (*Doherty*) (BMNH); 1 ♂, Lankhaung (*Swann*) (BMNH); 2 ♂, Htawgaw (*Swann*) (BMNH). **Vietnam**: 1 ♀, Haiphong (BMNH). **Thailand**: 10 ♂, 7 ♀, Bangkok, on *Oryza sativa*, 22.xii.1951–15.i.1952, 28.x.–23.xi.1952 (DA, Bangkok); 68 ♂, 91 ♀, Bangkok, at light, 1–31.xii.1968 (*Pholboon*) (DA, Bangkok); 3 ♂, 31 ♀, Bangkok (BMNH); 1 ♀, Khon Kaen, 22.xi.1955 (DA, Bangkok); 1 ♀, Pak Chong, Nakornrachsima, 16.x.1966 (DA, Bangkok); 5 ♀, Yala, 1.i.1964 (*Pholboon*) (DA, Bangkok); 1 ♀, Sukothai, 22.xi.1955 (DA, Bangkok); 1 ♂, Chiengmai, 6.ii.1928 (*Cockerell*) (BMNH); 1 ♂, Nonthaburi, 11.i.1951 (DA, Bangkok); 1 ♀, Thonburi, 1–13.x.1954 (DA, Bangkok); 1 ♂, 1 ♀, 20 km E. of Krabi, 21.ii.–10.iii.1962 (*Friedel*) (ZSBS, Munich); 2 ♂, Muak-Lek,

Saraburi, 1000 ft [300 m], i. (*Fruhstorfer*) (BMNH). **West Malaysia**: 1 ♂, 2 ♀, Kuala Lumpur, 18.xii. (*Kloss*) (BMNH); 4 ♂, 2 ♀, Kuala Lumpur, at light, 22.iii.1941 (*Pendlebury*) (BMNH); 2 ♂, 4 ♀, Kuala Lumpur, at light, 31.i.1924 (BMNH); 2 ♂, Kuala Lumpur, at light, 23.iv.1931 (*Pendlebury*) (BMNH); 1 ♂, 15 ♀, Penang, i.1897 (*Curtis*) (BMNH); 1 ♀, Penang (*Ridley*) (BMNH); 1 ♂, Malacca (BMNH); 5 ♂, 2 ♀, Perak (BMNH); 2 ♀, Pahang, 20–23.viii.1935 (BMNH); 1 ♂, Pahang, 19.xi.1922 (*Pendlebury*) (BMNH); 1 ♀, Johore (*Ridley*) (BMNH); 1 ♂, Port Dickson, 12.i.1941 (BMNH); 1 ♀, Kedah State (*Cadman*) (BMNH). **Singapore**: 1 ♂, Kranji, 7.i.1923 (*Chasen*) (BMNH); 3 ♀, no precise locality (*Ridley*) (BMNH). **Sumatra**: 2 ♀, Padang, Mt Talang (BMNH); 16 ♀, Padang (BMNH); 1 ♀, Liwa, 900–1400 m (*Doherty*) (BMNH); 33 ♂, 8 ♀, Dempo, 4000 ft [1210 m], viii.1923 (*Brooks*) (BMNH); 12 ♀, Sandaran Agong, Korinchi, 2450 ft [740 m], v-vi.1914 (*Robinson & Kloss*) (BMNH); 1 ♀, Atjeh, Takengon, 22.vii.1914 (*Wagensveld*) (RNH, Leiden). **Java**: 2 ♂, Java (BMNH) (paralectotypes of *Schoenobius minutellus* Zeller); 1 ♂, 2 ♀, Bali (*Doherty*) (BMNH); 2 ♀, Lombok, Pringabaja, iv.1896 (*Fruhstorfer*) (BMNH); 2 ♀, Lombok (NR, Stockholm); 2 ♂, 5 ♀, Lombok, 1500 ft [450 m], iv.–v.1896 (*Everett*) (BMNH); 9 ♀, Djoenggo Ardijoeno, 4500 ft [1360 m], v.1934 (*Kalis*) (BMNH); 6 ♀, Bandung (BMNH); 1 ♀, Bangdung, 700 m, 12.v.1940 (*Olthof*) (RNH, Leiden); 1 ♀, Palabuan (BMNH); 1 ♂, 2 ♀, Soekaboemi (*Walsh*) (BMNH); 8 ♀, Nongkodjadjar, 4000 ft [1210 m], vi.1934 (*Kalis*) (BMNH); 16 ♀, Git-Git, 5000 ft [1500 m], v.1936 (*Kalis*) (BMNH); 2 ♀, Singalangoe, Tengger, 5000 ft [1500 m], iv.1934 (*Kalis*) (BMNH); 1 ♀, Sindanglaya, 26.ix.1920 (AMNH, New York); 1 ♀, Buitenzorg, i.1928 (*Burgeff*) (ZSBS, Munich); 1 ♀, Tijikadjang, Baudjorwangi, 7–10.iv.1939 (*Lieftinck*); 1 ♂, 2 ♀, Soekaboemie (MNHN, Paris); 1 ♂, 1 ♀, Bezoeki (*de Vaal*) (MNHN, Paris); 5 ♀, Radjamandala, 20–21.xii.1940 (*Olthof*) (RNH, Leiden); 3 ♀, no further data (BMNH); 4 ♀, no further data (NR, Stockholm). **Borneo**: 2 ♀, Pulo Laut, vi.1891 (*Doherty*) (BMNH); 13 ♂, 4 ♀, Pontianak (*Andre*) (BMNH); 2 ♀, Kinabalu, xii.1898–ii.1899 (*Waterstradt*) (BMNH); 3 ♀, Mt Marapok, Dent Province (BMNH); 2 ♀, Sarawak, 13.ii.1908 (*Meade Waldo*) (BMNH); 1 ♀, Mt Mulu, 1000–4000 ft [300–1210 m] (*Hose*) (BMNH); 4 ♀, Tambunan, 4–6.viii.1956 (BMNH); 5 ♀, Labuan, iii.1892 (*Everett*) (BMNH); 1 ♀, Lawas, iv.1892 (*Everett*) (BMNH); 1 ♀, Kuching, vii.1902 (BMNH); 1 ♀, Tinom (*Wahr*) (BMNH); 1 ♂, 1 ♀, no further data (BMNH). **Sumba**: 1 ♂, 1887 (*Doherty*) (BMNH). **Sulawesi**: 12 ♂, 6 ♀, Minahassa, Tomohon, 1.vi.–2.vii.1954 (*Alston*) (BMNH); 2 ♀, Menado (*Bracekel*) (BMNH). **Philippines**: 1 ♂, 9 ♀, Los Banos, Luzon, vii.1911 (*Wileman*) (BMNH); 3 ♂, Los Banos, Luzon (*Baker*) (NMNH, Washington); 14 ♂, 5 ♀, Klondyke, Benquet, Luzon, 800 ft [240 m], 18.xii.1911–24.v.1912 (*Wileman*) (BMNH); 22 ♂, 10 ♀, Manila, 4.i.–8.ii.1913 (*Wileman*) (BMNH); 1 ♀, Manila, 15.xi.1907 (*Betton*) (BMNH); 3 ♀, nr Manila (*Whitehead*) (BMNH); 1 ♂, Sapiangao, Benquet, Luzon, 5600 ft [1700 m], 16.xii.1912 (*Wileman*) (BMNH); 6 ♂, 2 ♀, Montalban, Rizal, Luzon (*Wileman*) (BMNH); 2 ♂, 6 ♀, Taytai, 10–18.ii.1907 (*Betton*) (BMNH); 2 ♂, Naga Hill, 5000–7000 ft [1500–2100 m], viii.–xi.1889 (*Doherty*) (BMNH); 4 ♂, 5 ♀, Palali, Benquet, Luzon, 2000 ft [600 m], 23–28.vii.1912, 3.vii.1913 (*Wileman*) (BMNH); 3 ♂, 1 ♀, Mt Makiling, Luzon (*Baker*) (BMNH); 1 ♂, Baquio, Benquet, Luzon, 5000 ft [1500 m], 16.vi.1913 (*Wileman*) (BMNH); 2 ♀, Zamboanga, Mindanao (AMNH, New York); 1 ♀, Limay, Luzon, 21.xi.1913 (ZSBS, Munich); 1 ♀, Luzon, 5000–6000 ft [1500–1800 m] (*Whitehead*) (BMNH): 1 ♀, no further data (BMNH). **Taiwan**: 5 ♂, 38 ♀, Kanshirei, vi.1904, vii.–ix.1908, iii.1909 (*Wileman*) (BMNH); 7 ♂, 38 ♀, Takow, viii.–ix.1904, vi.1905, vi.1906 (*Wileman*) (BMNH); 4 ♂, 8 ♀, Tainan, ii, iv, v, vi, 1904–07 (*Wileman*) (BMNH); 1 ♂, 2 ♀, Banshorio, 9.vi., 26.v.1906 (*Wileman*) (BMNH); 2 ♀, Koannania, vi.–viii.1906 (*Wileman*) (BMNH); 1 ♂, 1 ♀, Taihoku (*Shiraki*) (BMNH); 3 ♂, 13 ♀, vi.1904 (*Wileman*) (BMNH); 2 ♂, 3 ♀, Tainan (*Cheng*) (BMNH); 1 ♂, 3 ♀, Wanta nr Hori, Nan Tou Hsien, x.1965, iii.–v.1966 (CNC, Ottawa); 1 ♂, 5 ♀, no further data (BMNH). **Hong Kong**: 1 ♀, Sheung Shui, on *Oryza sativa*, 9.vii.1965 (*So*) (BMNH). **China**: 1 ♀ (BMNH) [abdomen missing] (paralectotype of *Chilo gratiosellus* Walker); 1 ♀, Shanghai (BMNH); 1 ♂, 1 ♀, Kwangtung, on *Oryza sativa*, 14.viii.1934 (*Chiu*) (BMNH); 3 ♀, Mt Omai, 4000 ft [1210 m], xii.1931 (BMNH); 1 ♀, Chu San I., vii.1892 (*Walker*) (BMNH); 1 ♀, Pagoda, ix.1899 (*de la Garde*) (BMNH); 5 ♀, Omei-Shan, 3500 ft [1060 m], vi.–vii.1890 (BMNH); 1 ♂, Youboi, Hainan, vi.1904 (BMNH); 1 ♂, Taipinshi, Hainan, viii.1905 (BMNH); 2 ♀, no further data (BMNH). **Japan**: 2 ♀, Iida San, Higo, Kyushu, 20.v.1895, 1899 (*Wileman*) (BMNH); 1 ♀, Osumi, Kyushu, 15.ix.1895 (*Wileman*) (BMNH); 1 ♂, Higo, Kyushu, 12.v.1899 (*Wileman*) (BMNH); 1 ♀, Amamiosima, Kagosima, 23.vii.1927 (CNC, Ottawa); 1 ♂, Amami, Kyushu, 23.vii.1959 (*Yukawa*) (CNC, Ottawa); 1 ♀, Osaka, Honshu, 2.vi.1959 (*Matuda*) (CNC, Ottawa).

Scirpophaga innotata (Walker, 1863)
(Figs 91, 92, 122, 183, 184, Map 8)

Tipanaea innotata Walker, 1863*b*: 523; Hampson, 1895: 914; 1896: 46 [as synonym of *Scirpophaga chrysorrhoa* Zeller]. Holotype ♀ [not ♂ as stated by Walker], BORNEO: Sarawak, Saunders' Coll (BMNH, Pyralidae genitalia slide no. 4029) [examined].



Map 12

Scirpophaga sericea Snellen, 1880: 79; Munroe et al., 1958: 84. Lectotype ♀, SULAWESI: Bonthain (RNH, Leiden), designated by Munroe et al. (1958: 84) [examined]. [Synonymized with *innotata* Walker by van der Goot, 1925.]

Scirpophaga innotata (Walker) van der Goot, 1925: 1–308; Jepson, 1954: 9.

Tryporyza innotata (Walker) Common, 1960: 340, figs 1D, 2B, 3E, 3F, 8F, pl. 2, figs 6, 7; Kapur, 1967: 6, 25.

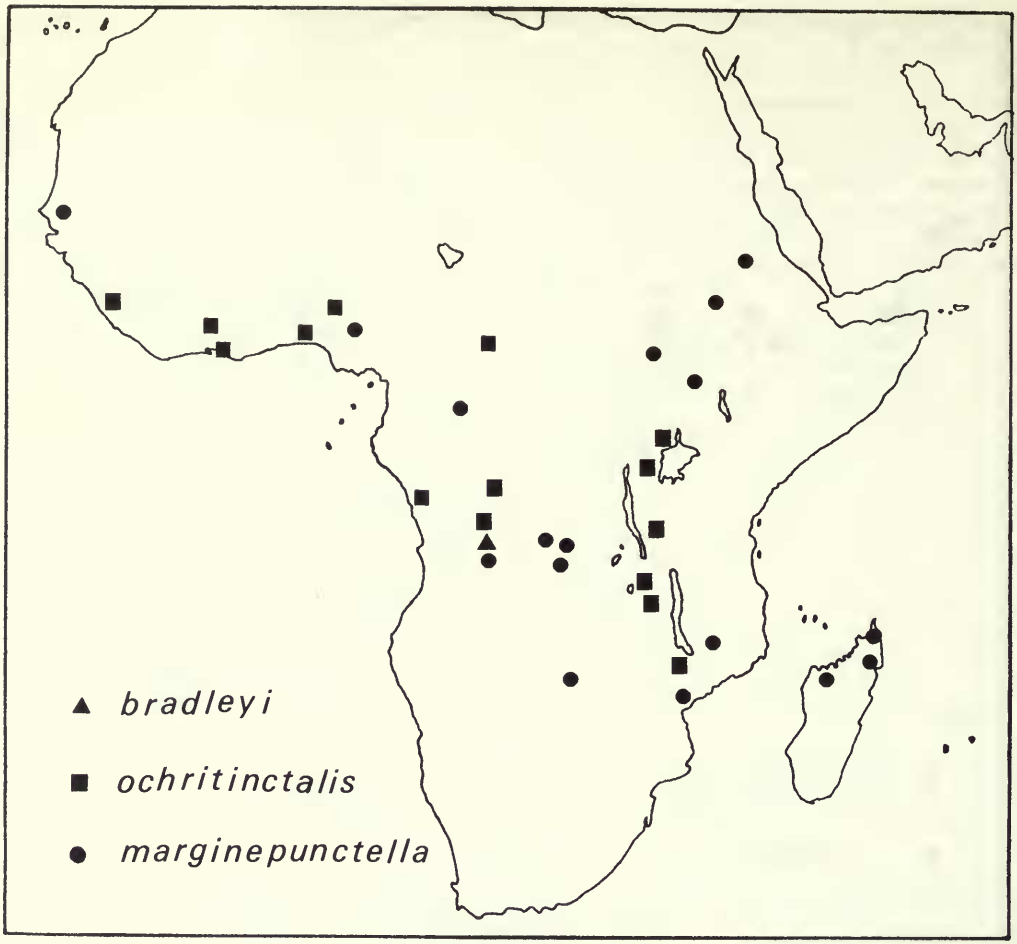
♂ (Fig. 183). 18–22 mm. Pale ochreous white. Length of labial palpus approximately 2 times diameter of compound eye. Forewing ochreous white, underside fuscous; hindwing white, costal half suffused with pale ochreous, stronger on underside.

♀ (Fig. 184). 22–33 mm. White. Forewing suffused with pale ochreous, underside white; hindwing white; frenulum double-bristled. Anal tuft white.

GENITALIA ♂ (Figs 91, 92). As in *S. incertulas*, but the subteguminal process with a single spine.

GENITALIA ♀ (Fig. 122). As in *S. incertulas*.

REMARKS. The genitalia of both sexes of *S. innotata* are similar to those of *S. incertulas*; the only difference is in the subteguminal process of the male, which is a single spine in this species and a bifid spine in *S. incertulas*. The external characters of these two species are quite different; in *S. incertulas* the male has an ochreous forewing with markings, the female a yellow forewing with a dark fuscous spot. In *S. innotata* both the male and female have white forewings without markings.



Map 13

From the extensive material examined this species is apparently found only from eastern Asia to Australia. Carl (1962) mentioned *S. innotata* attacking rice in Pakistan, but this is probably a misidentification.

BIOLOGY. For host plants see p. 193.

DISTRIBUTION. Borneo, Philippines, Sulawesi, Sumbawa, Sumba, Flores, Timor, New Guinea, Australia.

MATERIAL EXAMINED

Borneo: 1 ♂, 1 ♀, Pulo Laut (*Doherty*) (BMNH); 1 ♂, 1 ♀, Labuan, 31.i., 12.ii.1963 (*Barlow*) (BMNH); 1 ♂, Likong, on *Oryza sativa*, 13.ix.1967 (BMNH); 1 ♂, Kapit, on *Oryza sativa*, 1.iii.1965 (*Rothschild*) (BMNH); 3 ♀, Kuching, in rice-fields, 3.viii–23.xii.1961 (*Teo*) (BMNH); 2 ♀, Kuching, 3.ix., 3.xi.1962 (BMNH); 1 ♀, 80 mls [129 km] N. Pontinak, iv.1909 (BMNH); 6 ♂, 2 ♀, Sarawak, on *Oryza sativa* (BMNH); 1 ♂, Simanggang, on *Oryza sativa*, 22.i.1962 (*Wan*) (BMNH); 1 ♀, Trusan, 16.ix.1962 (BMNH). **Philippines**: 1 ♂, 2 ♀, Iloilo, 6.ix.1928 (*Sison*) (NMNH, Washington); 2 ♂, Victorias, Occ. Negros, 19, 22.xii.1927 (*Uichanco*) (NMNH, Washington); 1 ♀, Victorias, Occ. Negros, on *Saccharum officinarum*, 28.x.1927 (NMNH, Washington); 1 ♀, no further data (BMNH). **Sulawesi**: 1 ♀, Bonthain (*Doherty*) (BMNH); 2 ♂, 9 ♀, Tolitoli, xi., xii.1895 (*Fruhstorfer*) (BMNH); 1 ♀, Minahassa, 8.vi.1954 (*Alston*) (BMNH); 1 ♂, Maros, 1 ♀, Tjamba (*Doherty*) (BMNH); 1 ♀, Maros, 13.vii.1910 (BMNH); 2 ♂, Samanga, xi.1895 (*Fruhstorfer*) (BMNH); 1 ♂, 2 ♀, Parepare, 27–28.viii.1904 (UM, Oxford). **Sumbawa**: 1 ♂, 1887

(*Doherty*) (BMNH). **Sumba**: 2 ♀, 1887 (*Doherty*) (BMNH). **Flores**: 1 ♀, Koelawi, Paloë I., 3100 ft [940 m], iii.1907 (*Kalis*) (BMNH). **Timor**: 2 ♂, 2 ♀, Dili, v.1892 (*Doherty*) (BMNH). **New Guinea**: 2 ♂, Digoel R., 1924 (*Vertenten*) (ZM, Amsterdam). **Australia**: 1 ♂, Derby (*Turner*) (BMNH); 1 ♂, 1 ♀, Humpty Doo, 3.iv.1959 (*Common*) (BMNH); 1 ♀, Port Darwin, 1910 (*Dodd*) (BMNH); 1 ♀, Percy I., 1910 (*Lathy*) (BMNH).

The *gotoi*-group

Forewing with vein R_1 anastomosed with *Sc*. Frenulum a single bristle in both sexes.

GENITALIA ♂. Uncus and gnathos long and slender; tegumen with sclerotized thickening ×-shaped; subteguminal process lobe-like; aedeagus slender, vesica with minute spines.

GENITALIA ♀. Ductus bursae sclerotized throughout, section between ostium bursae and ductus seminalis constricted; corpus bursae with dense spines.

The *gotoi*-group consists of one species, *S. gotoi*. The ×-shaped dorsal sclerotized thickening of the tegumen and the lobe-like subteguminal process are similar to those in the *occidentella*-group, but in the *gotoi*-group the anellus is lined with minute spines not as strongly sclerotized as those in the *occidentella*-group. In the female genitalia the ductus bursae is sclerotized throughout as in the *praelata*-group but the 8th tergal plate is not produced ventrolaterally. Externally vein R_1 in the *gotoi*-group anastomoses with *Sc* but in the *praelata*-group they are separate.

Scirpophaga gotoi sp. n.

(Figs 67, 68, 112, 185, 186, Map 9)

♂ (Fig. 185). 23–24 mm. Ochreous yellow. Length of labial palpus approximately 3 times diameter of compound eye. Forewing shining ochreous yellow with dark fuscous spot at lower angle of cell, R_1 usually anastomosed with *Sc*, underside fuscous; hindwing ochreous yellow, underside suffused with fuscous in costal half.

♀ (Fig. 186). 26–30 mm. As in ♂ but underside of wings not suffused with fuscous; frenulum single-bristled. Anal tuft ochreous yellow.

GENITALIA ♂ (Figs 67, 68). Tegumen with dorsal sclerotized thickening ×-shaped; subteguminal process lobe-like; aedeagus slender; vesica with minute spines.

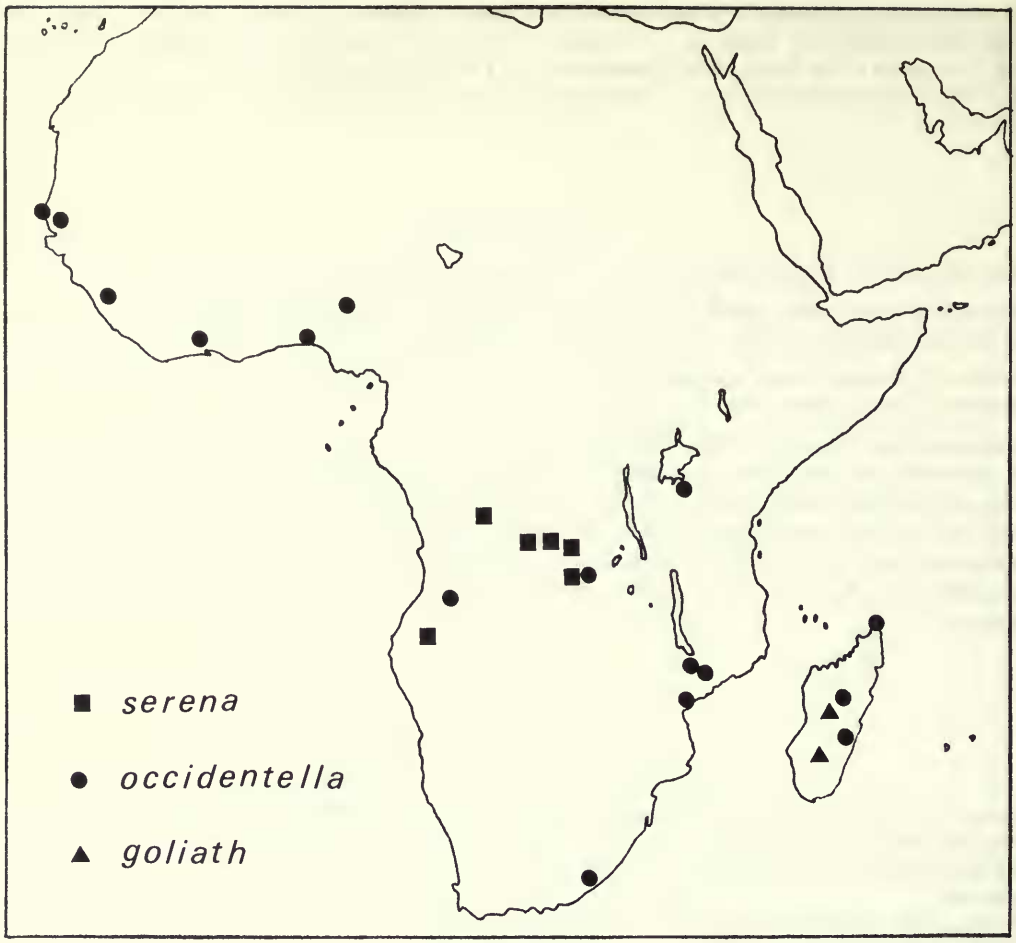
GENITALIA ♀ (Fig. 112). Ostium bursae membranous; ductus bursae wholly sclerotized, section between ostium bursae and ductus seminalis constricted, gradually dilating towards corpus bursae; corpus bursae with dense spines.

REMARKS. Both sexes of this species are very similar to the female of *S. incertulas* in coloration and in the presence of the spot in the forewing, but in *S. gotoi* the wings are more shining. *S. gotoi* also differs in having vein R_1 anastomosing with *Sc* and the frenulum in the female is of the one-bristled type, while in *S. incertulas* vein R_1 is usually not anastomosed with *Sc* and the frenulum in the female consists of two bristles. In the genitalia these two species are quite distinct. In *S. gotoi* the male has the tegumen with the dorsal sclerotized thickening ×-shaped and a lobe-like subteguminal process. In the female the ostium bursae is not wrinkled and the ductus bursae is sclerotized throughout the duct, while in *S. incertulas* the ostium bursae is wrinkled and the ductus bursae is membranous.

S. incertulas has been studied intensively in many rice-growing countries in Asia, including Japan. Because of the similarity between *S. gotoi* and the female of *S. incertulas*, *S. gotoi* should not be overlooked.

BIOLOGY. Unknown.

DISTRIBUTION. Japan, China.



Map 14

MATERIAL EXAMINED

Holotype ♂, **Japan**: Niitsu City [37°48′N, 139°09′E], Niigata Pref. (*S. Sakurai*) (CNC, Ottawa).

Paratypes. **Japan**: 1 ♀, data as holotype (CNC, Ottawa); 1 ♂, same data as holotype, 15.vii.1963 (CNC, Ottawa); 1 ♀, Niigata University, 30.vii.1962 [Japanese label] (CNC, Ottawa).

Non-paratypic material. **China**: 1 ♀, Lungtan, nr Nanking. Prov. Kiangsu, 27.vii.1933 (*Höne*) (MAK, Bonn); 1 ♀, same locality, 28.viii.1933 (*Höne*) (LN, Karlsruhe).

This species is named after Mr H. E. Goto, Imperial College of Science and Technology, London.

The *whalleyi*-group

Forewing with vein R_1 anastomosed with *Sc*. Frenulum in male a single bristle, in female with double fused bristle.

GENITALIA ♂. Uncus and gnathos long, slender, tegumen with dorsal sclerotized thickening somewhat triangular, subteguminal process membranous; aedeagus slender, vesica with a group of curved spined cornuti.

GENITALIA ♀. Ductus seminalis arising from ductus bursae near ostium bursae; corpus bursae membranous.

The *whalleyi*-group, consisting of one species, differs from the others by the membranous subteguminal process in the male genitalia.

Scirpophaga whalleyi sp. n.

(Figs 93, 94, 124, 187, 188, Map 5)

♂ (Fig. 187). 19–21 mm. Ochreous yellow. Labial palpus suffused with yellow, in length approximately 2 times diameter of compound eye. Forewing yellow, vein R_1 anastomosed with *Sc*, underside pale ochreous; hindwing white with pale yellow suffusion in costal half.

♀ (Fig. 188). 21–27 mm. Coloration as in male but paler and underside of forewing not suffused with ochreous; frenulum double-fused bristled. Anal tuft pale yellowish white.

GENITALIA ♂ (Figs 93, 94). Uncus and gnathos long slender; tegumen with dorsal sclerotized thickening somewhat triangular; subteguminal process membranous with sclerotized base; aedeagus slender, vesica with small spines, a group of curved-spined cornuti present.

GENITALIA ♀ (Fig. 124). Ostium bursae membranous; lined with small spines; ductus seminalis and ductus bursae strongly sclerotized near ostium bursae, otherwise membranous; corpus bursae membranous.

REMARKS. In both sexes, *S. whalleyi* is similar to the female of *S. incertulas* except that the dark fuscous spot on the forewing, which is present in *S. incertulas*, is absent in *S. whalleyi*. In the female of *S. incertulas* vein R_1 usually does not anastomose with *Sc* and the frenulum consists of two bristles, while in *S. whalleyi*, R_1 anastomoses with *Sc* and the frenulum consists of a double-fused bristle. The male genitalia are also similar to those of *S. incertulas*, but the subteguminal process is membranous, and the cornuti in the vesica of the aedeagus consist of a group of curved spines instead of the two unequal spines found in *S. incertulas*. The female genitalia of *S. whalleyi* are quite different from those of *S. incertulas* in that the ostium bursae is not wrinkled and the corpus bursae is membranous.

BIOLOGY. Unknown.

DISTRIBUTION. Sri Lanka, India.

MATERIAL EXAMINED

Holotype ♂, **Sri Lanka**: 'Dambool [Dambulla, 7°51′N, 80°40′E], Ceylan' (BMNH, Pyralidae genitalia slide no. 11015).

Paratypes. **Sri Lanka**: 1 ♀, same data as holotype (BMNH); 1 ♂, Dambool [Dambulla], xi.1902, Mackwood Coll. (BMNH); 2 ♂, 1 ♀, Habarana [Habarane], xi.1902, Mackwood Coll. (BMNH); 1 ♀, Apura, xii.1902, Mackwood Coll. (BMNH); 4 ♀, Puttalam (BMNH); 1 ♀, Hambanto-ta (BMNH); 1 ♀, no precise locality (BMNH); 2 ♀, no precise locality, Paravicini Coll. (BMNH).

Non-paratypic material. **India**: 1 ♂, 2 ♀, Calcutta, 1858 (*Atkinson*) (BMNH); 1 ♀, Madras, vii.1891 (BMNH); 1 ♀, Nudangalam, Madras, in rice-field, 30.x.1962 (BMNH).

This species is named after Dr P. E. S. Whalley, British Museum (Natural History), London.

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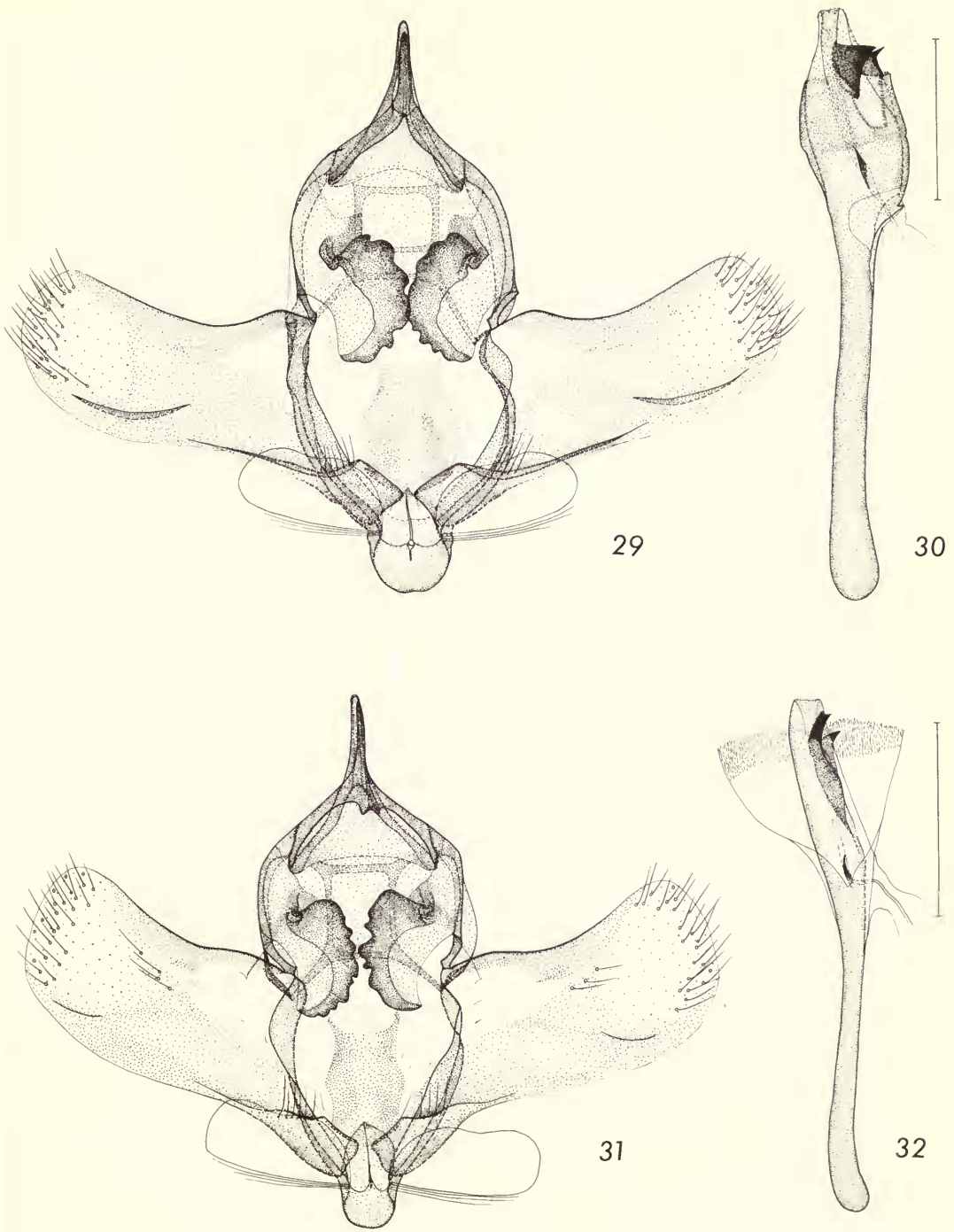
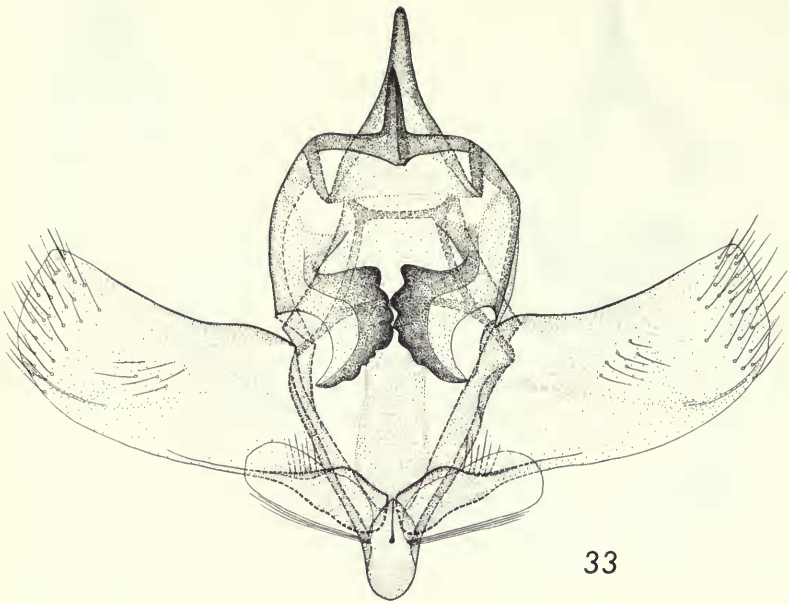
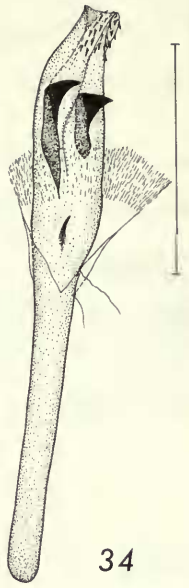
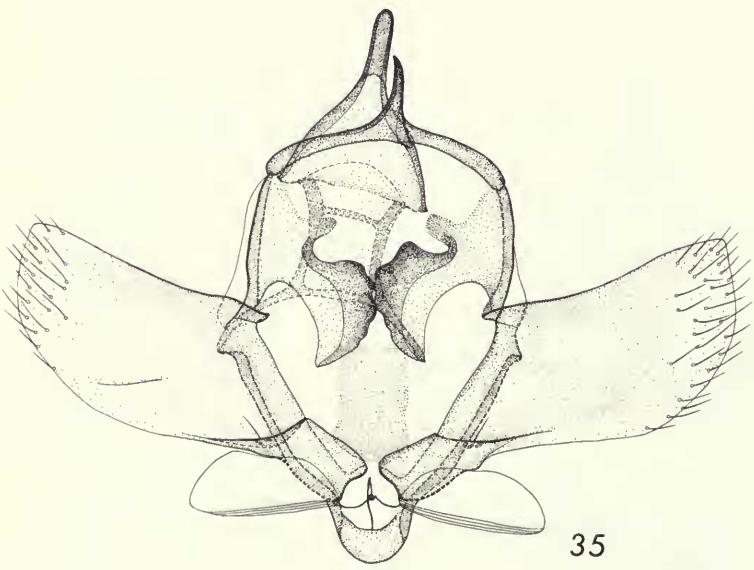
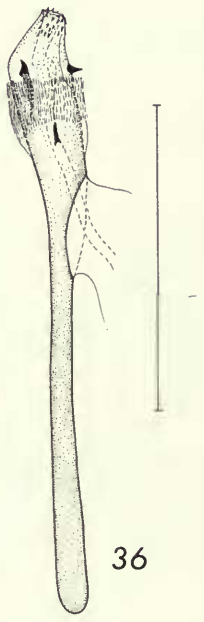


Figs 29–32 Male genitalia. 29, 30, *Scirpophaga praelata* (Scopoli). 31, 32, *S. xanthopygata* Schawerda.

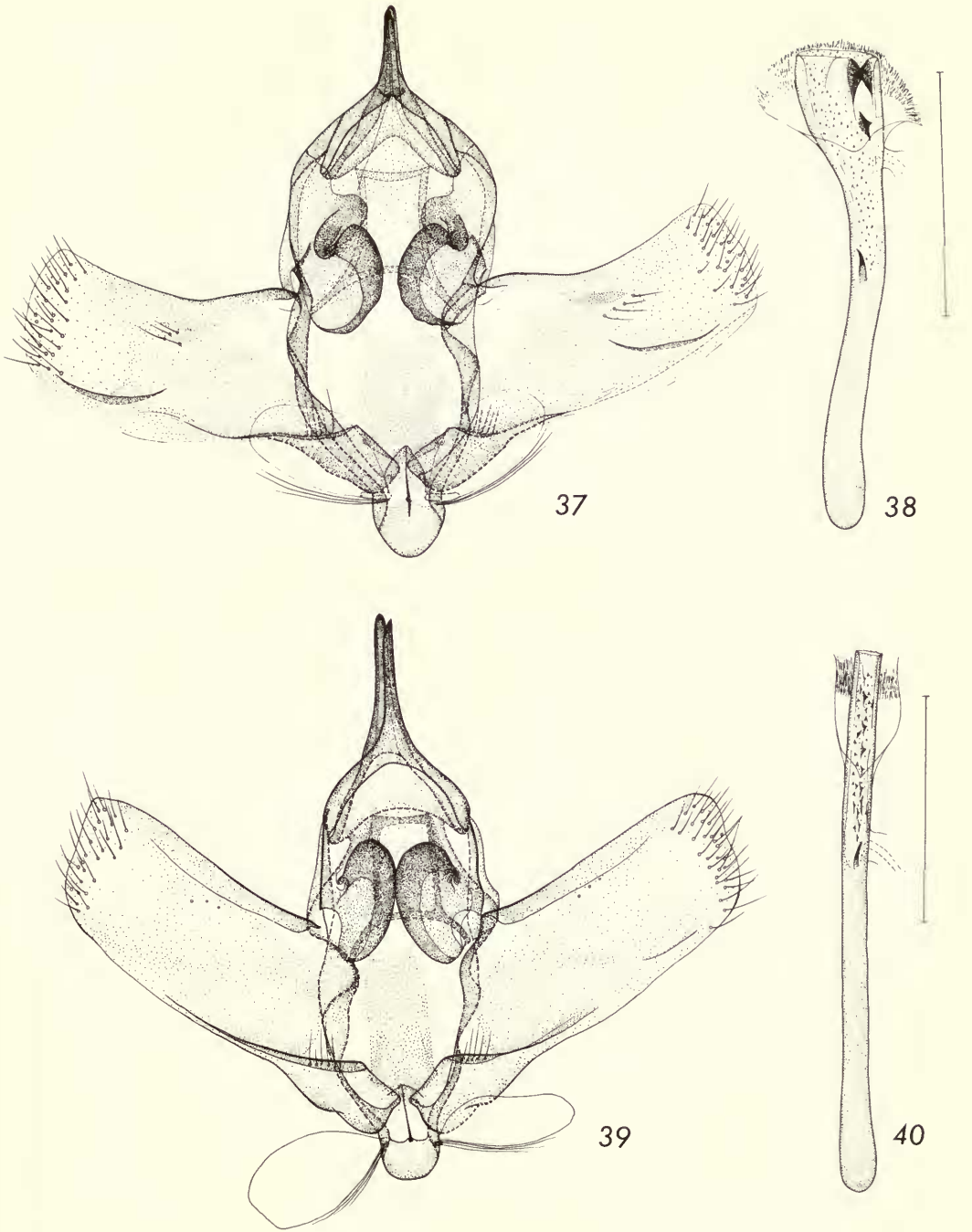




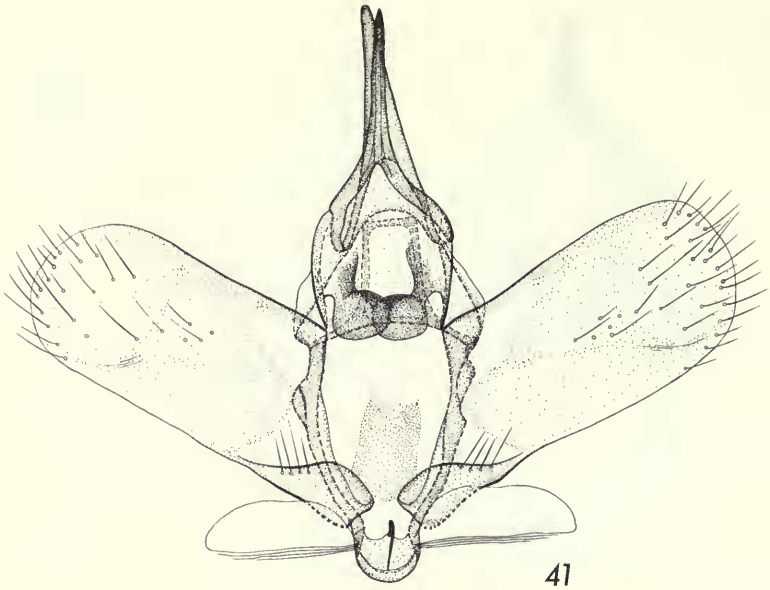


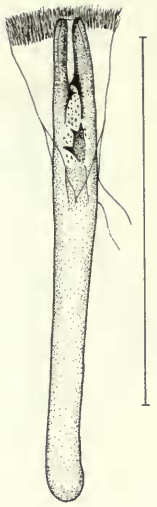


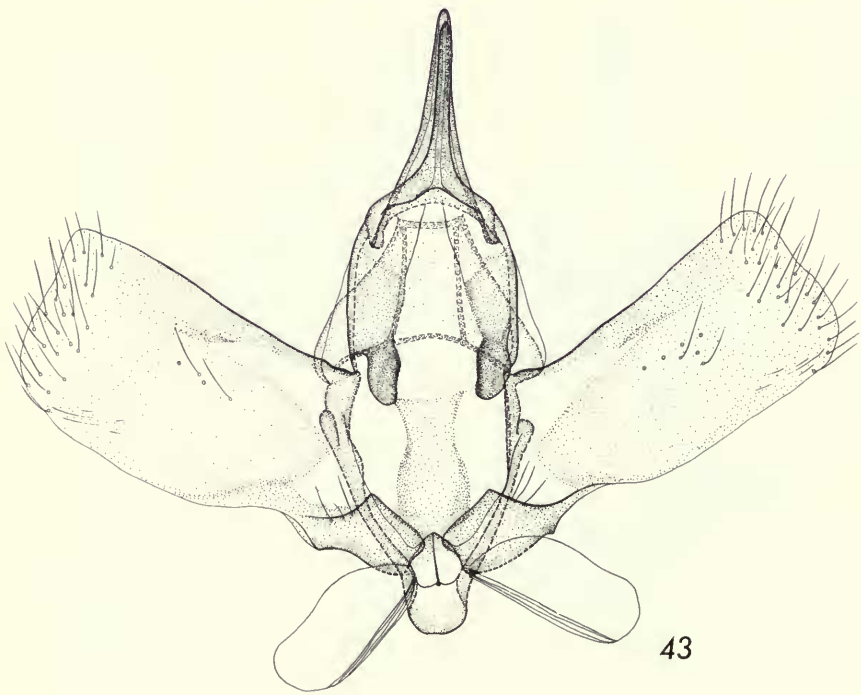
Figs 33–36 Male genitalia. 33, 34, *Scirpophaga nivella* (Fabricius). 35, 36, *S. phaedima* Common.

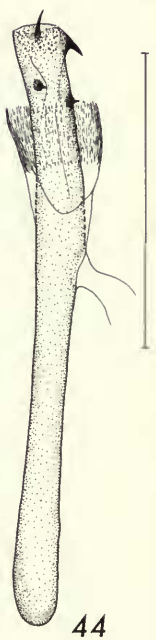


Figs 37–40 Male genitalia. 37, 38, *Scirpophaga parvalis* (Wileman). 39, 40, *S. melanoclista* Meyrick.

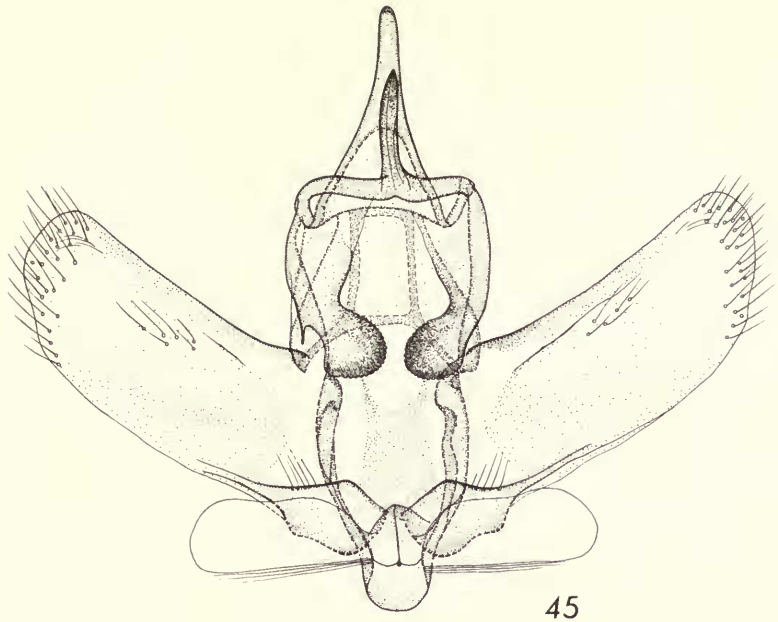


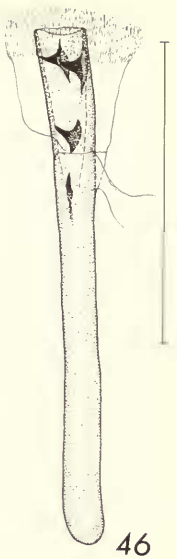


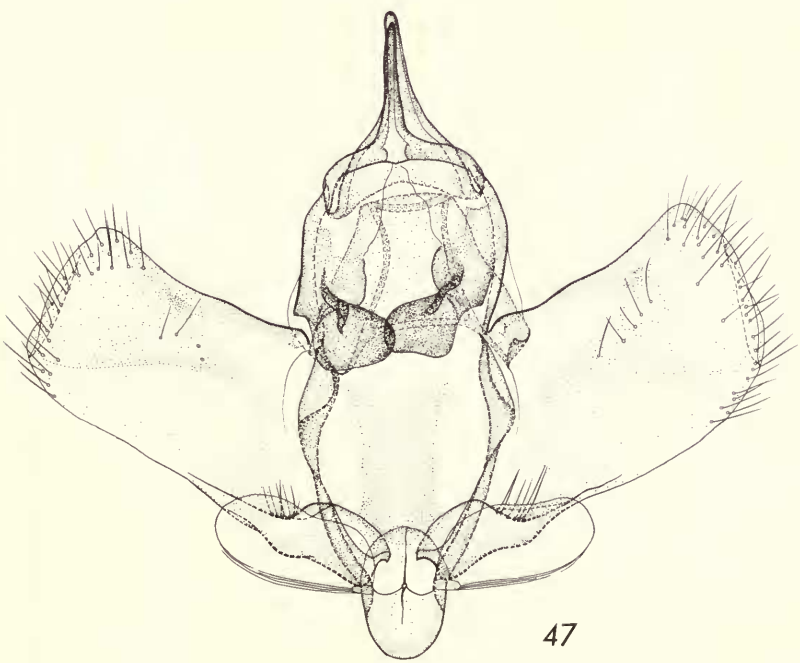


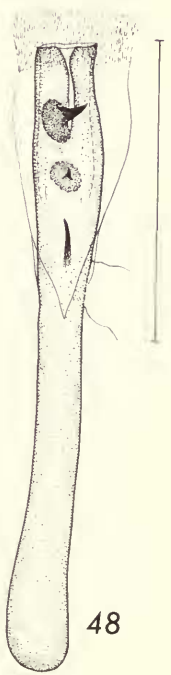


Figs 41–44 Male genitalia. 41, 42, *Scirpophaga gilviberbis* Zeller. 43, 44, *S. percna* Common.

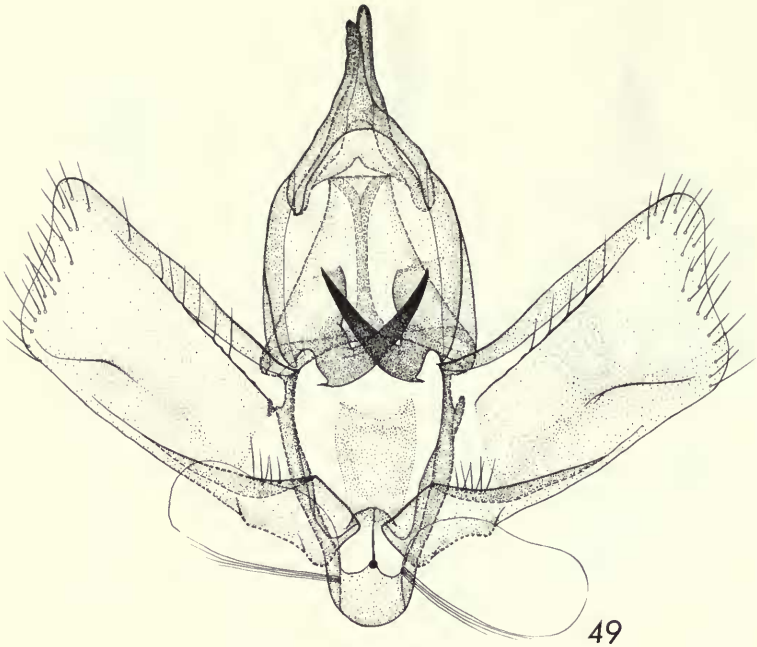


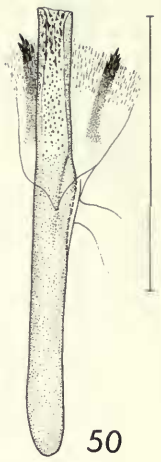


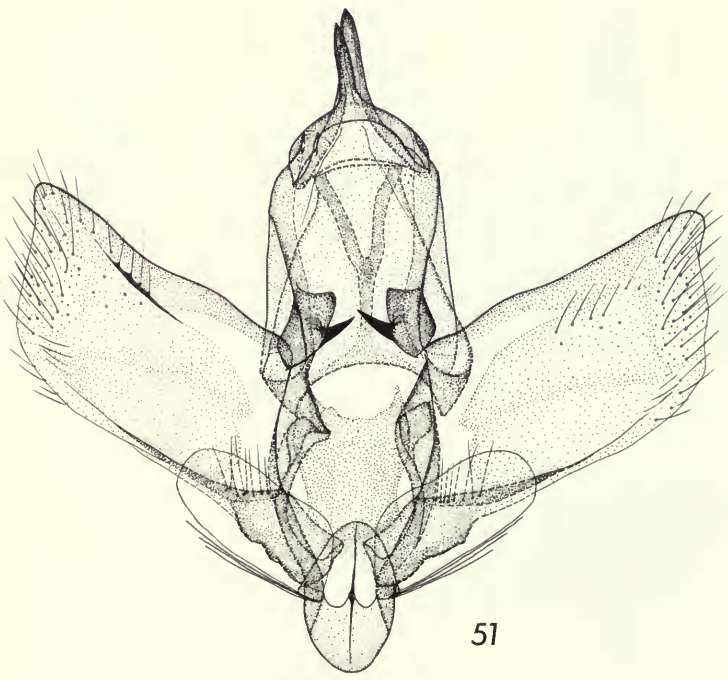


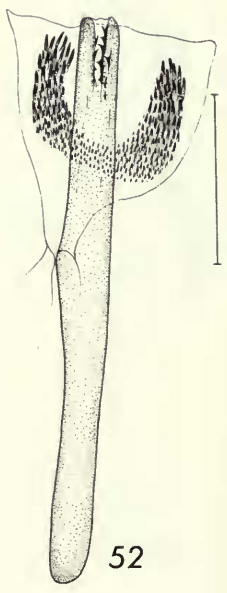


Figs 45–48 Male genitalia. 45, 46, *Scirpophaga imparella* (Meyrick). 47, 48, *S. xantharrenes* Common.

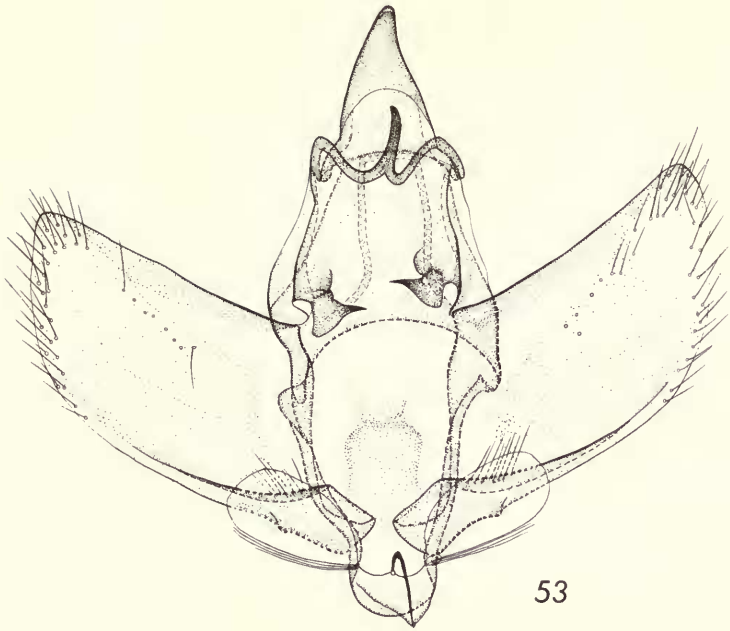


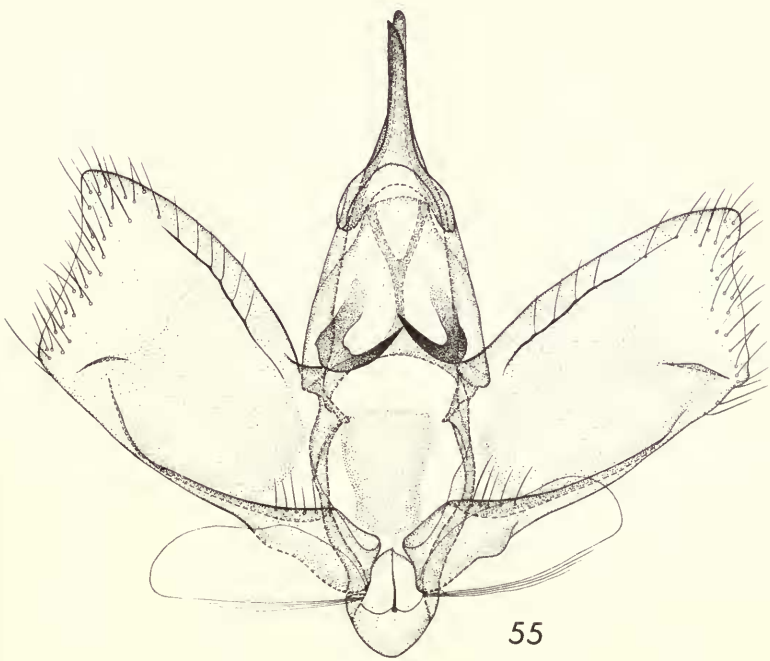


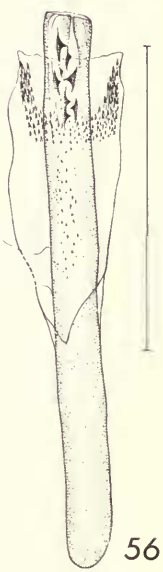




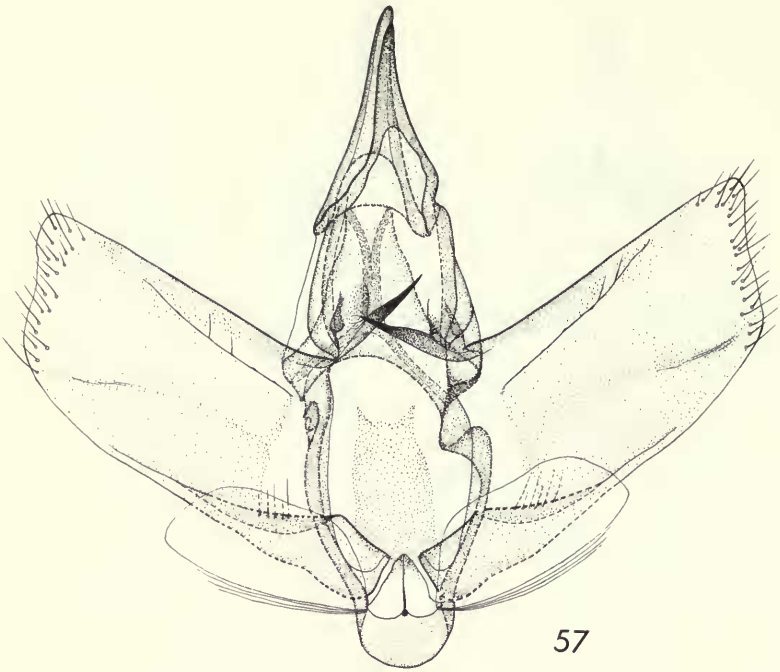
Figs 49–52 Male genitalia. 49, 50, *Scirpophaga excerptalis* (Walker). 51, 52, *S. magnella* de Joannis.

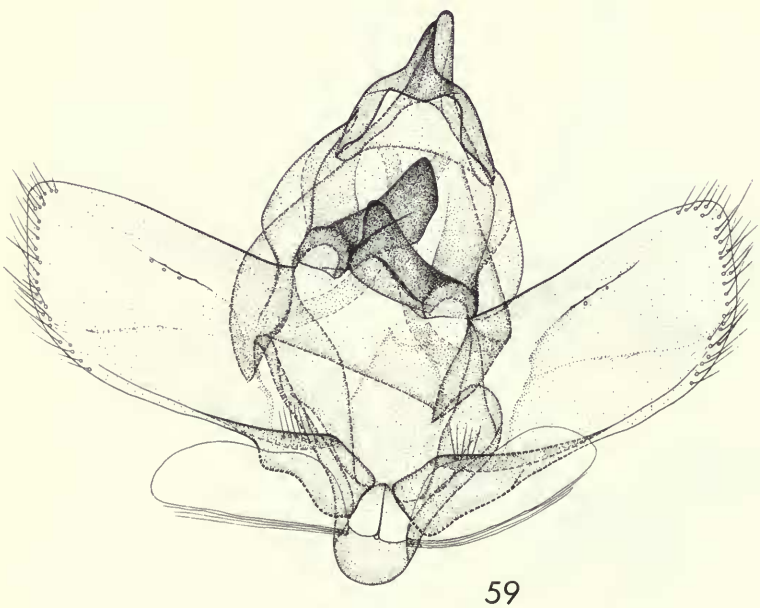


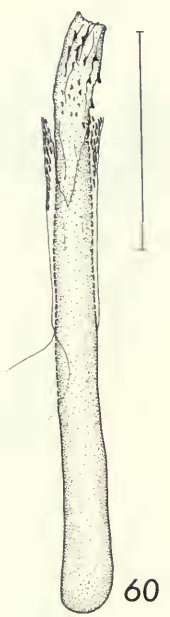




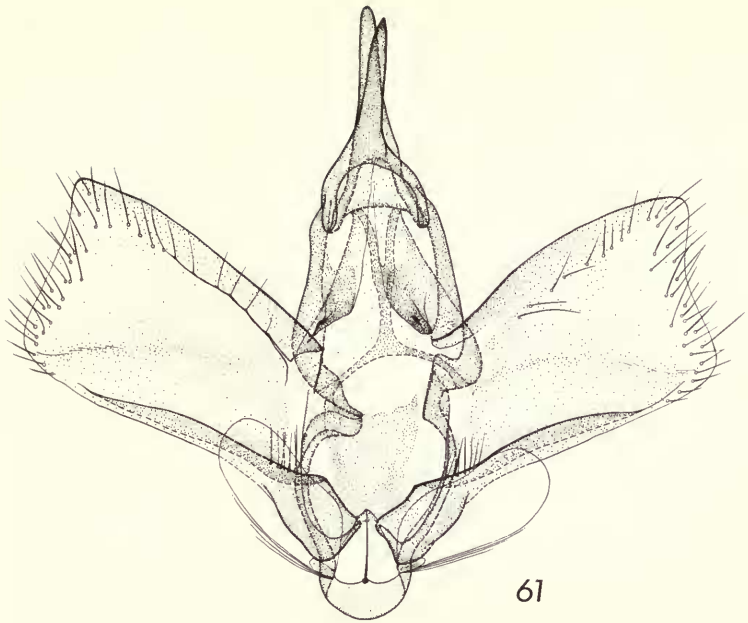
Figs 53–56 Male genitalia. 53, 54, *Scirpophaga tongyaii* sp. n. 55, 56, *S. brunnealis* (Hampson).

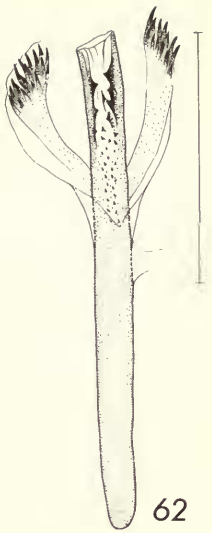


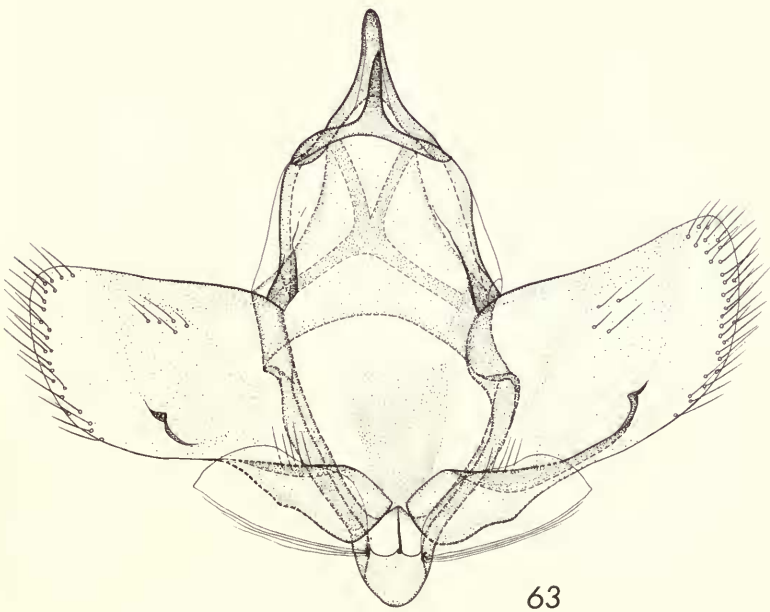


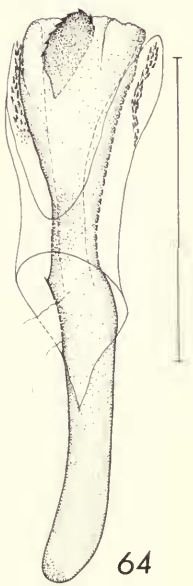


Figs 57–60 Male genitalia. 57, 58, *Scirpophaga ochritinctalis* (Hampson). 59, 60, *S. bradleyi* sp. n.

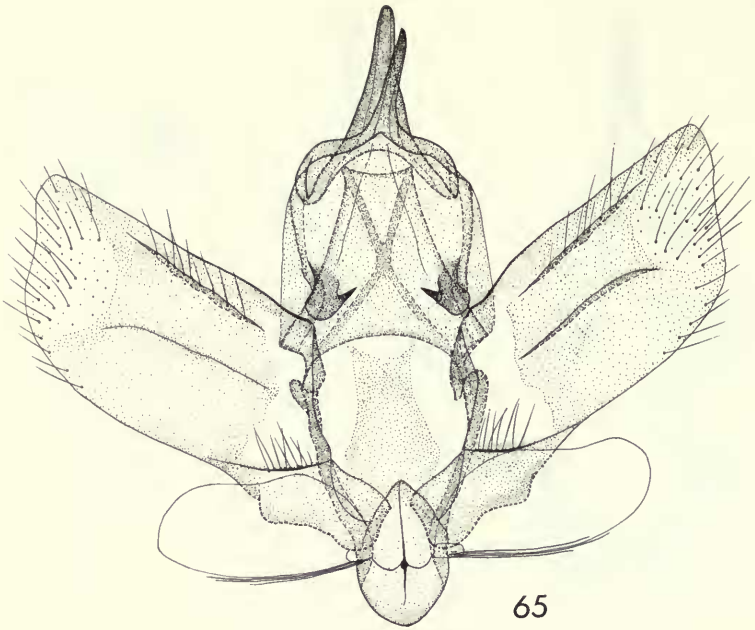


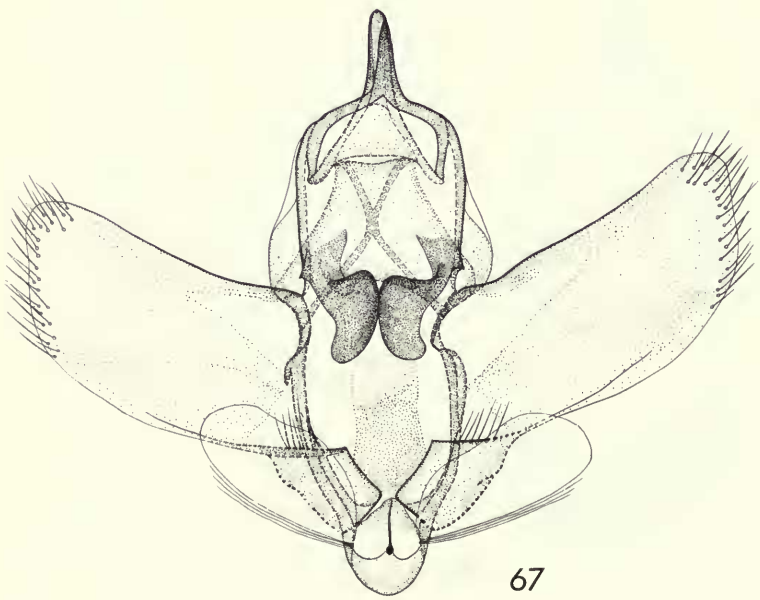


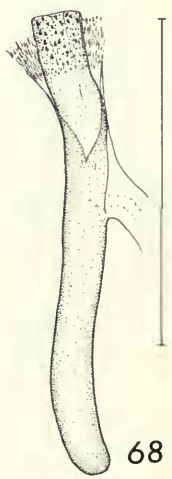




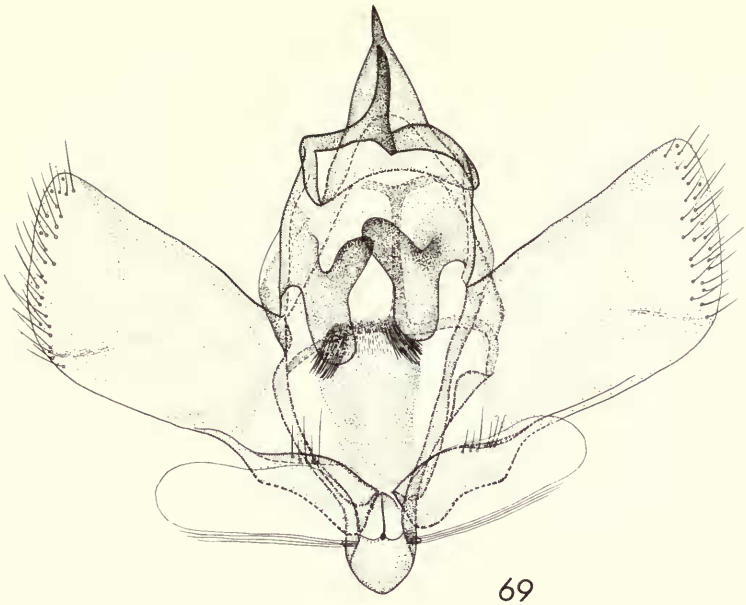
Figs 61–64 Male genitalia. 61, 62, *Scirpophaga khasis* sp. n. 63, 64, *S. flavidorsalis* (Hampson).

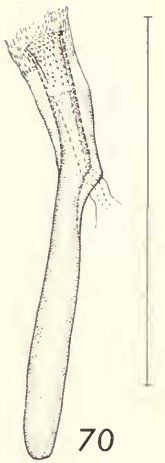


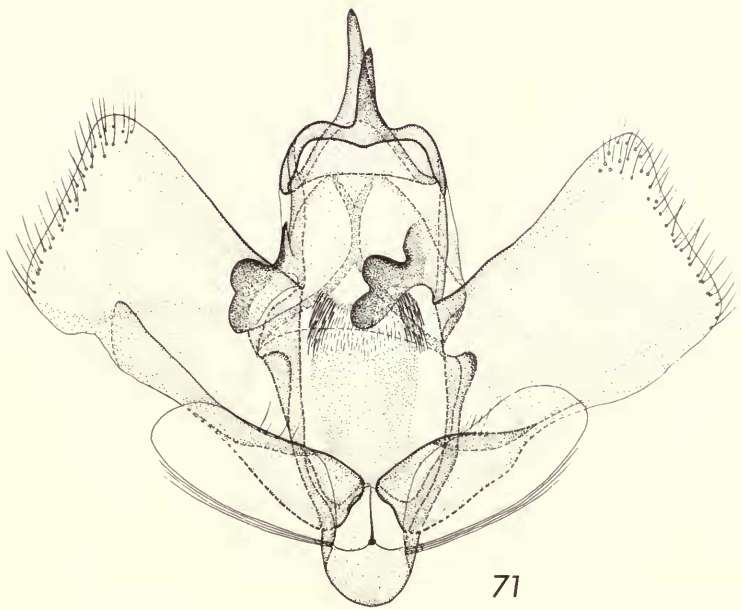




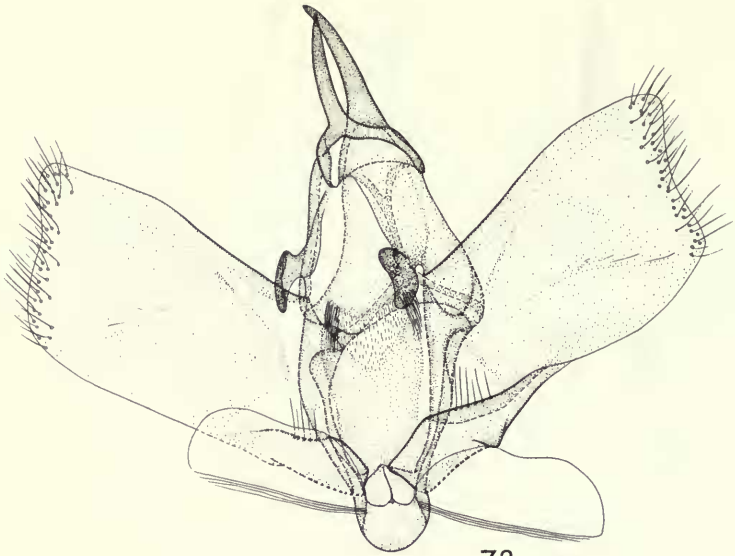
Figs 65–68 Male genitalia. 65, 66, *Scirpophaga xanthogastrella* (Walker). 67, 68, *S. gotoi* sp. n.

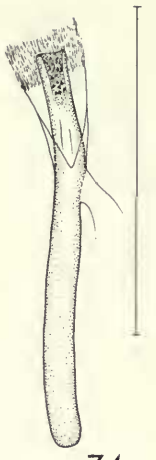


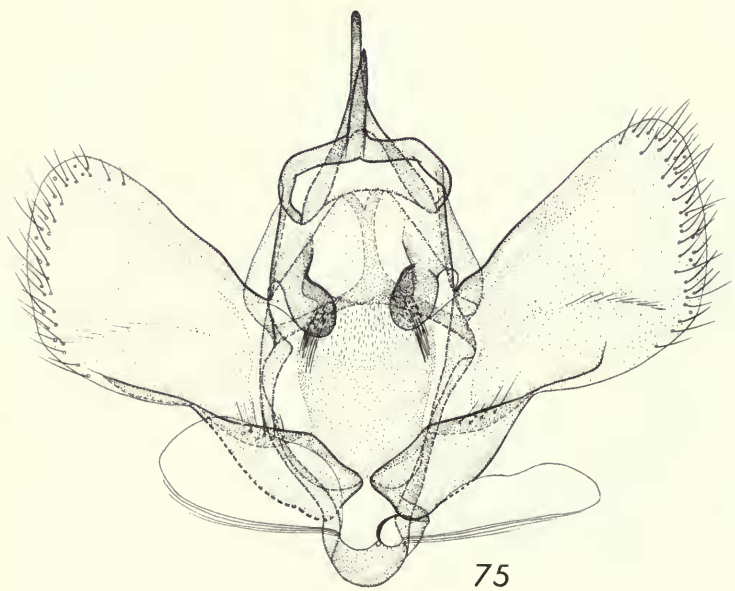




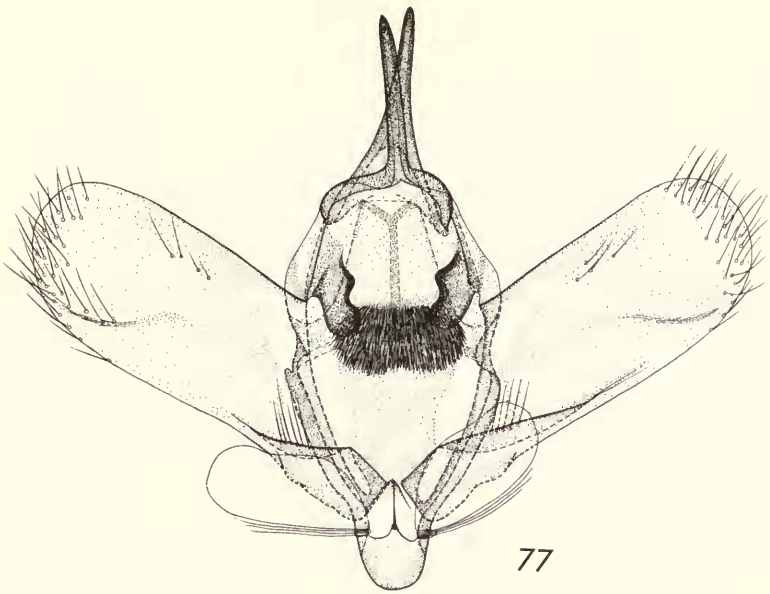
Figs 69–72 Male genitalia. 69, 70, *Scirpophaga occidentella* (Walker). 71, 72, *S. fusciflua* Hampson.

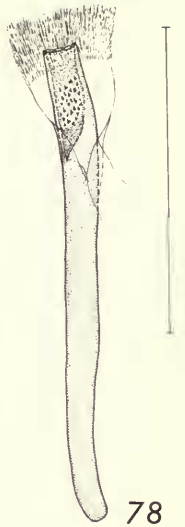


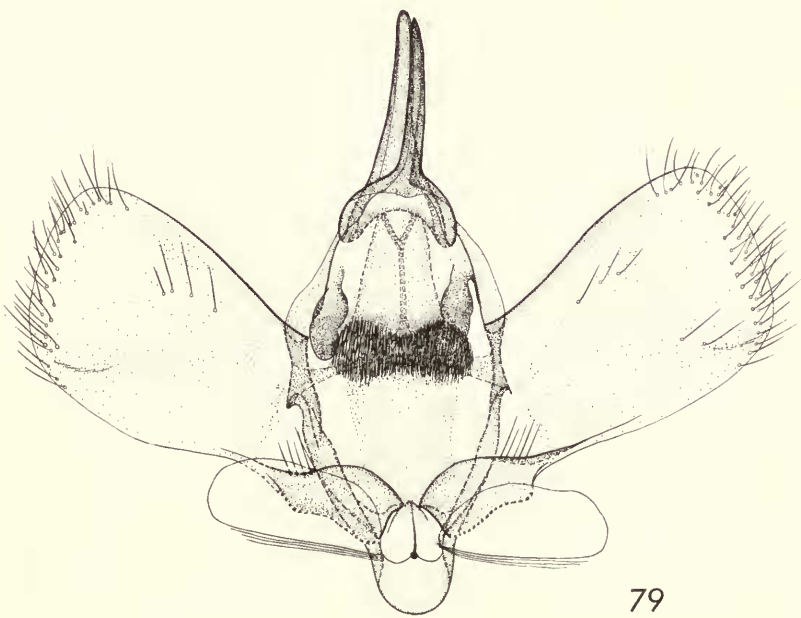


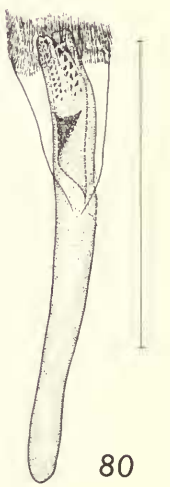


Figs 73–76 Male genitalia. 73, 74, *Scirpophaga ochroleuca* Meyrick. 75, 76, *S. virginia* Schultze.

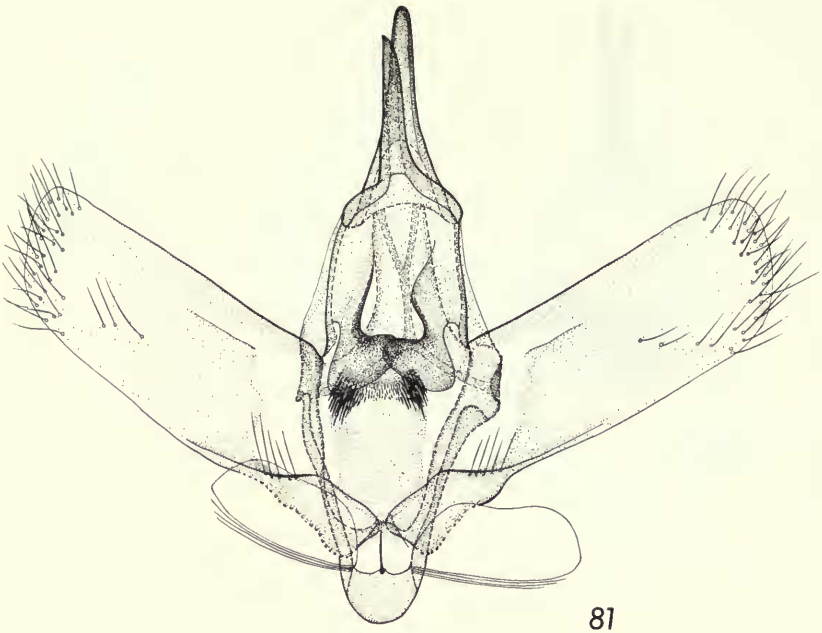


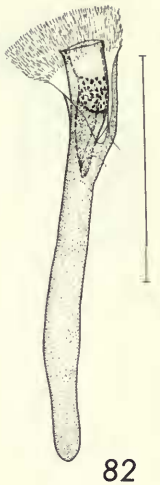


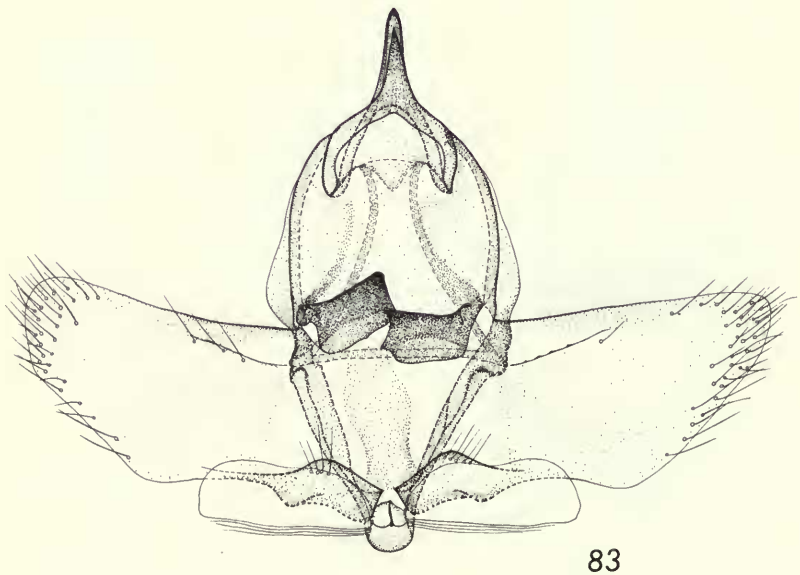


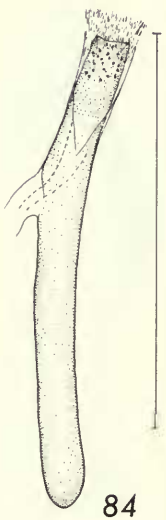


Figs 77–80 Male genitalia. 77, 78, *Scirpophaga subumbrosa* Meyrick. 79, 80, *S. marginepunctella* (de Joannis).

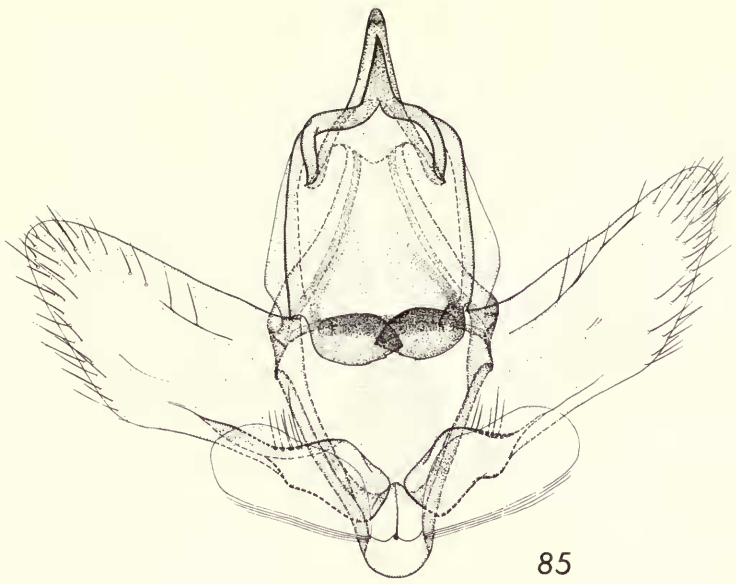


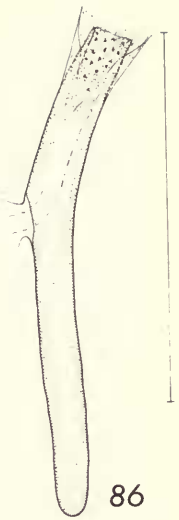


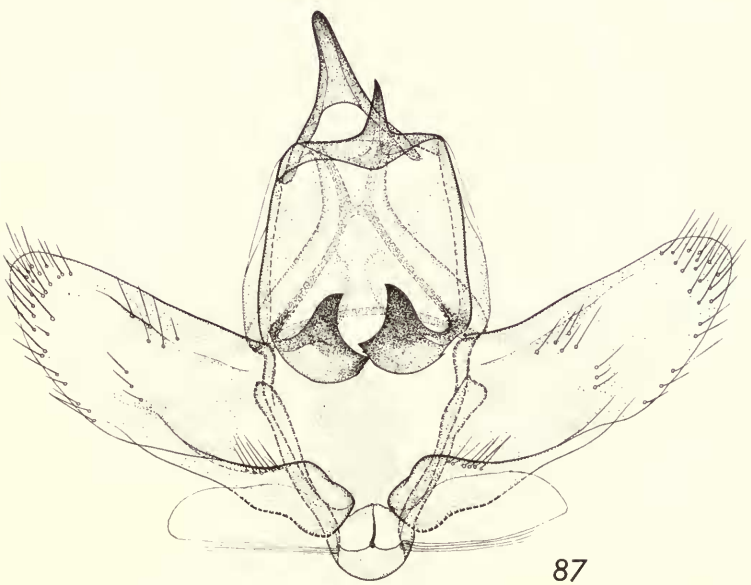


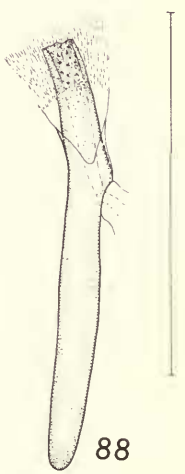


Figs 81–84 Male genitalia. 81, 82, *Scirpophaga serena* (Meyrick). 83, 84, *S. lineata* (Butler).

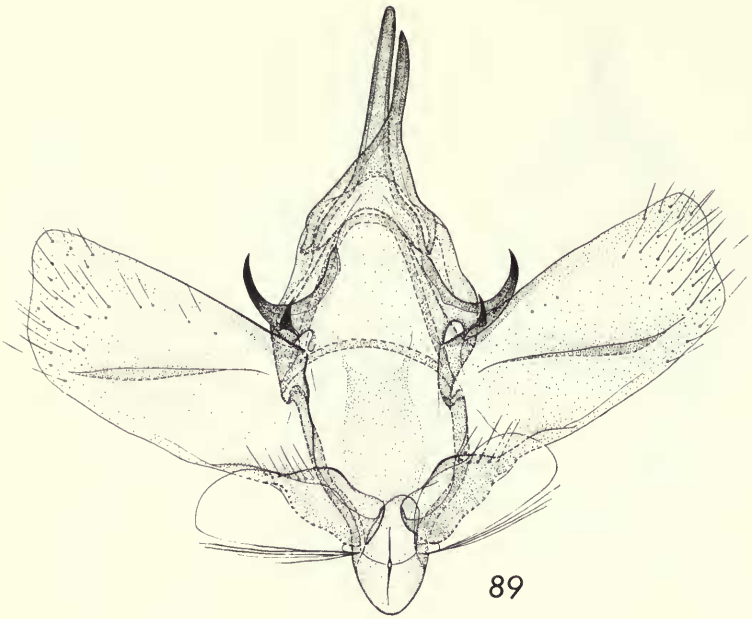


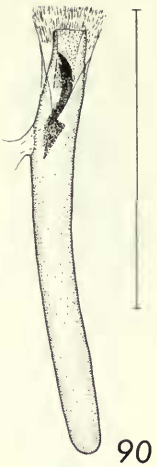


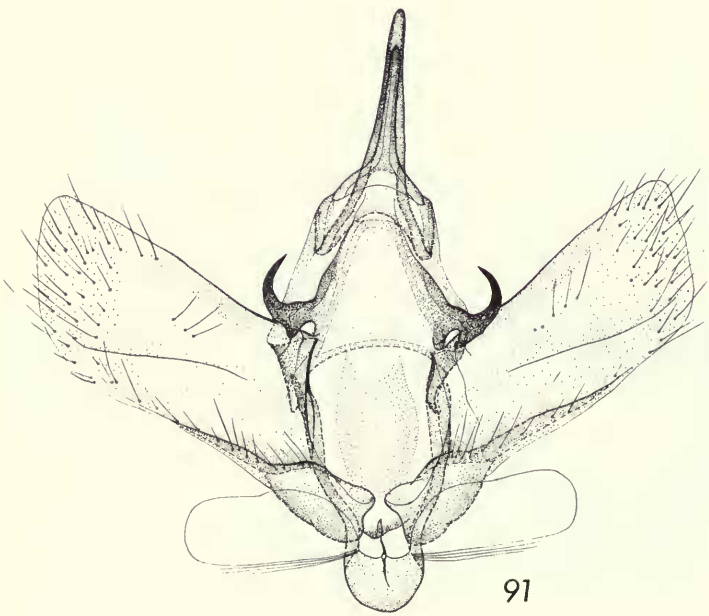




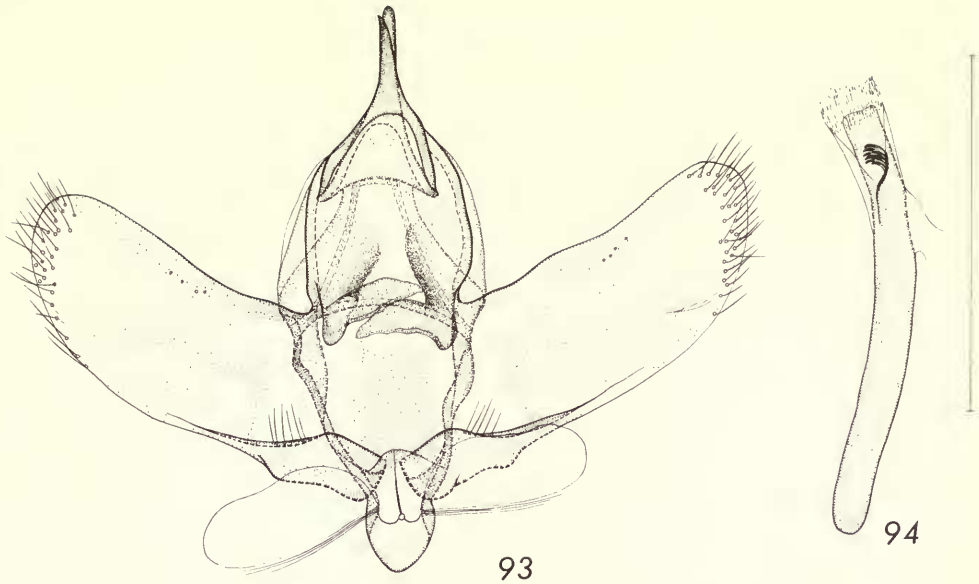
Figs 85–88 Male genitalia. 85, 86, *Scirpophaga aurivena* (Hampson). 87, 88, *S. auristrigella* (Hampson).



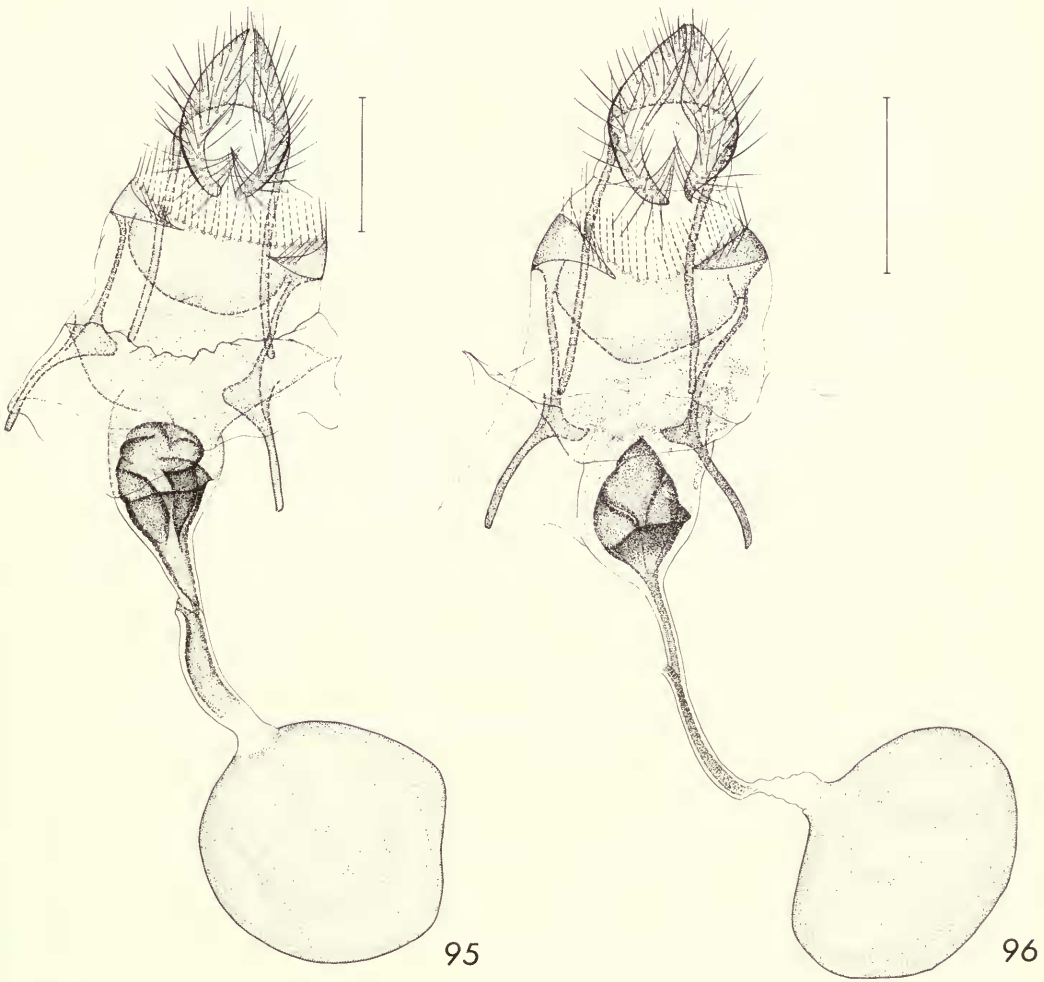




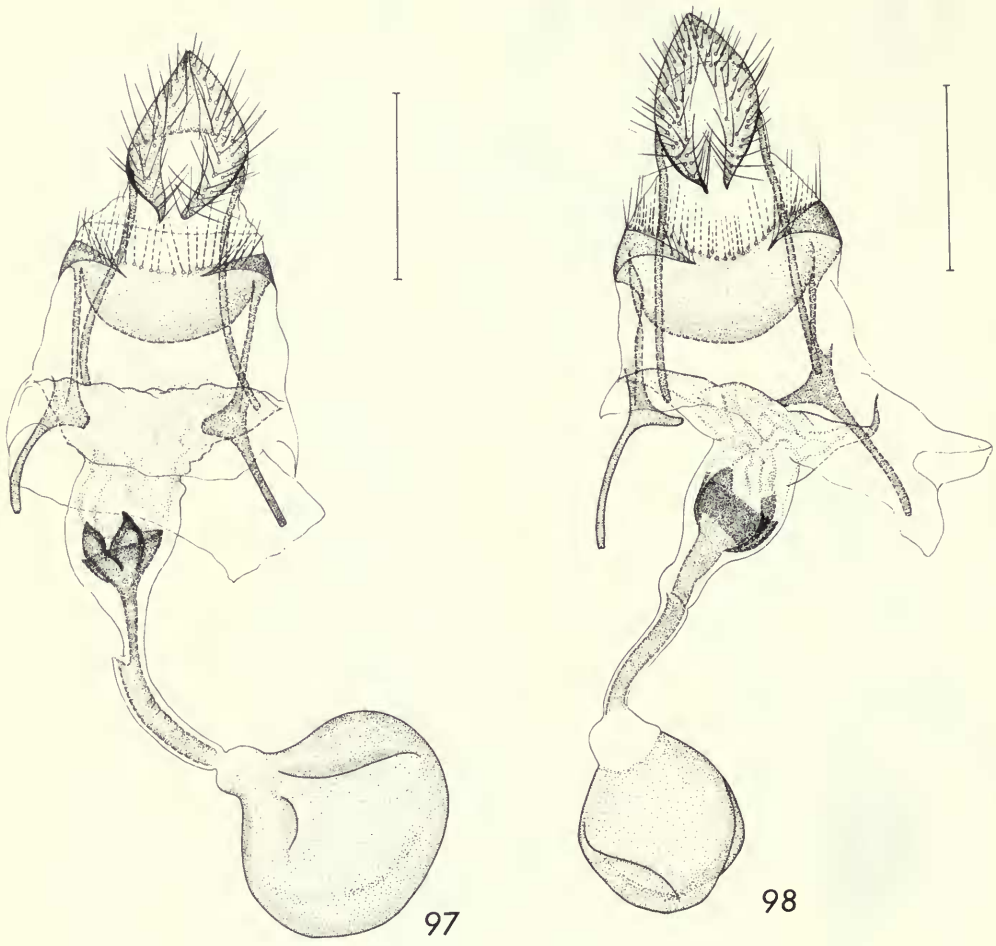
Figs 89–92 Male genitalia. 89, 90, *Scirpophaga incertulas* (Walker). 91, 92, *S. innotata* (Walker).



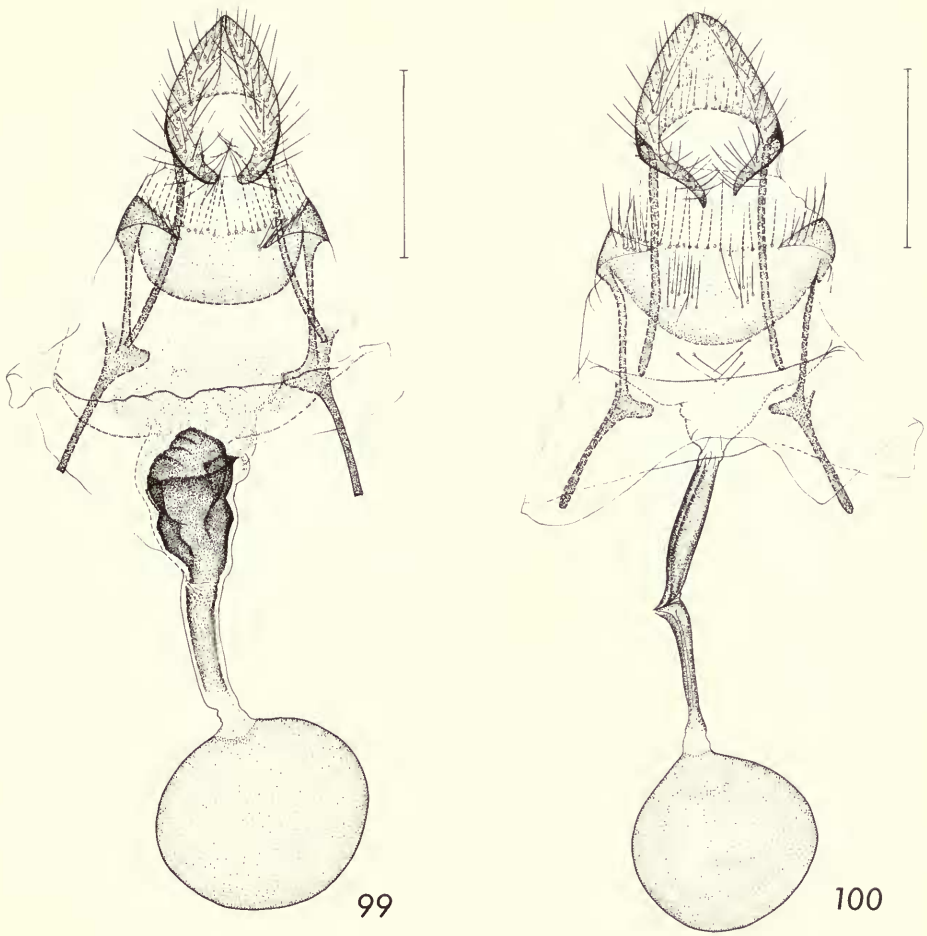
Figs 93–94 Male genitalia of *Scirpophaga whalleyi* sp. n.



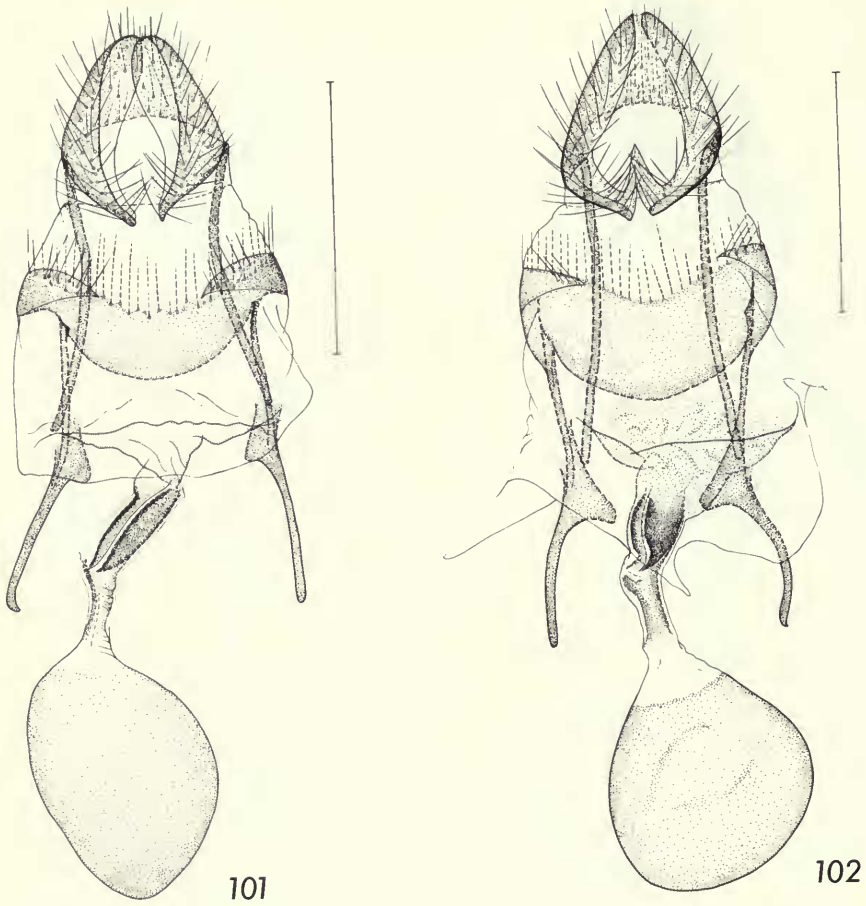
Figs 95, 96 Female genitalia. 95, *Scirpophaga praelata* (Scopoli). 96, *S. xanthopygata* Schawerda.



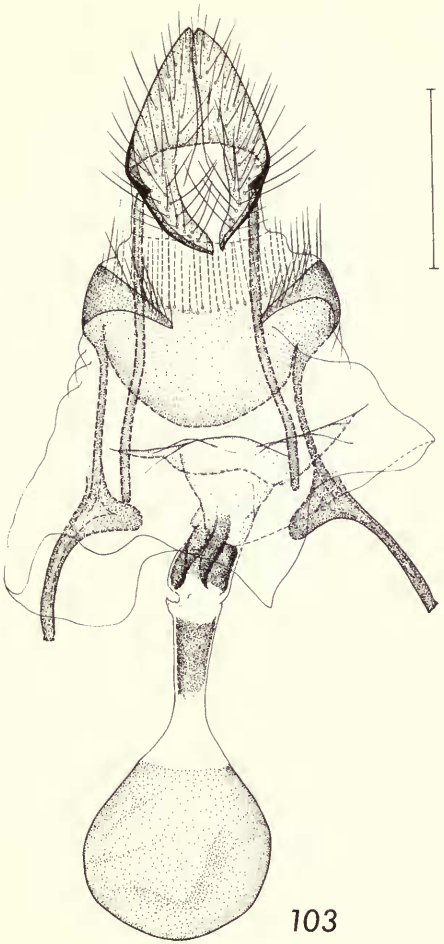
Figs 97, 98 Female genitalia of *Scirpophaga nivella* (Fabricius).

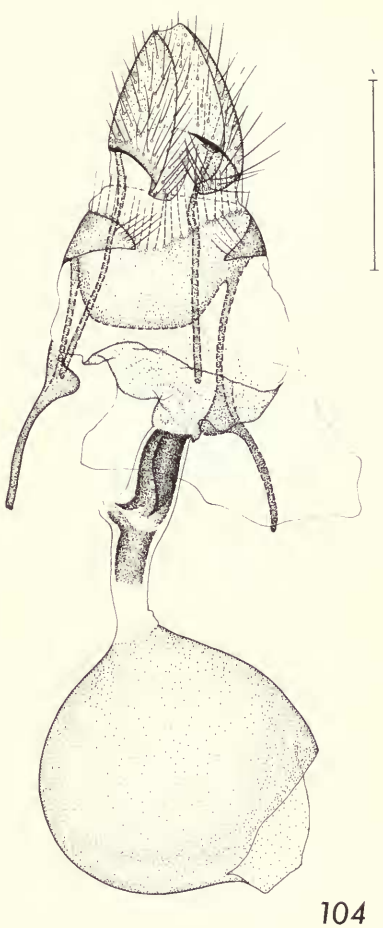


Figs 99, 100 Female genitalia. 99, *Scirpophaga parvalis* (Wileman). 100, *S. melanoclista* Meyrick.

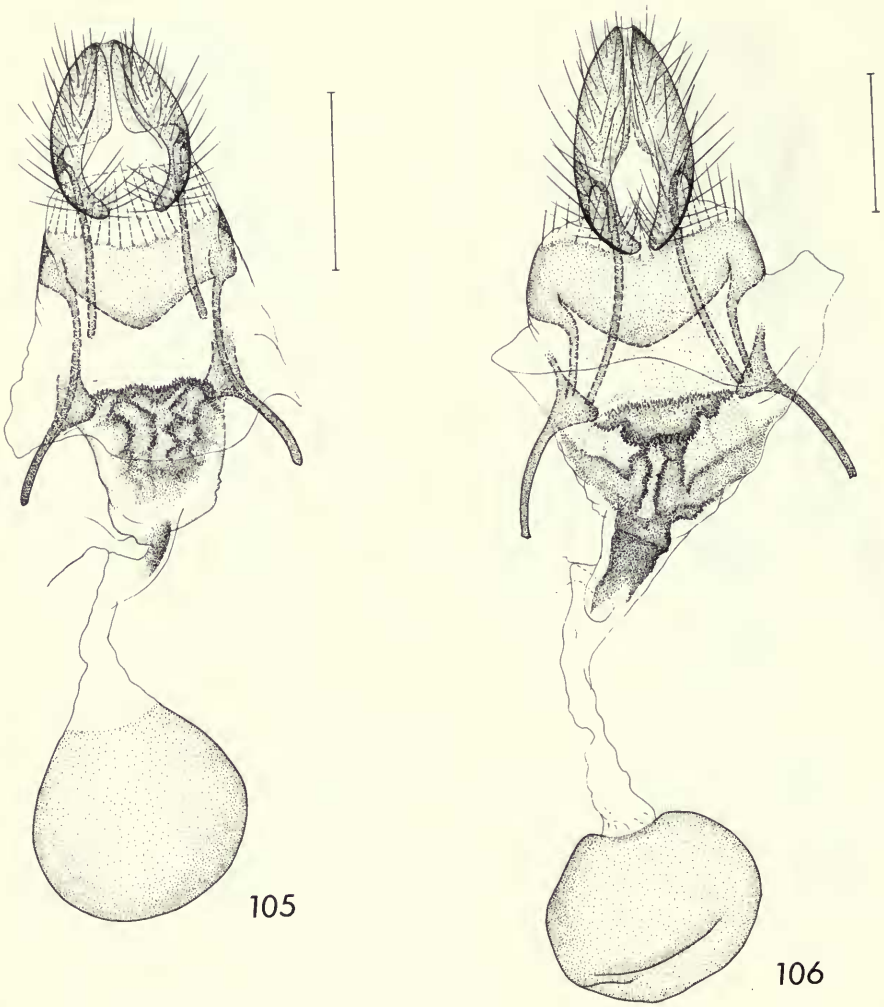


Figs 101, 102 Female genitalia. 101, *Scirpophaga gilviberbis* Zeller. 102, *S. percna* Common.

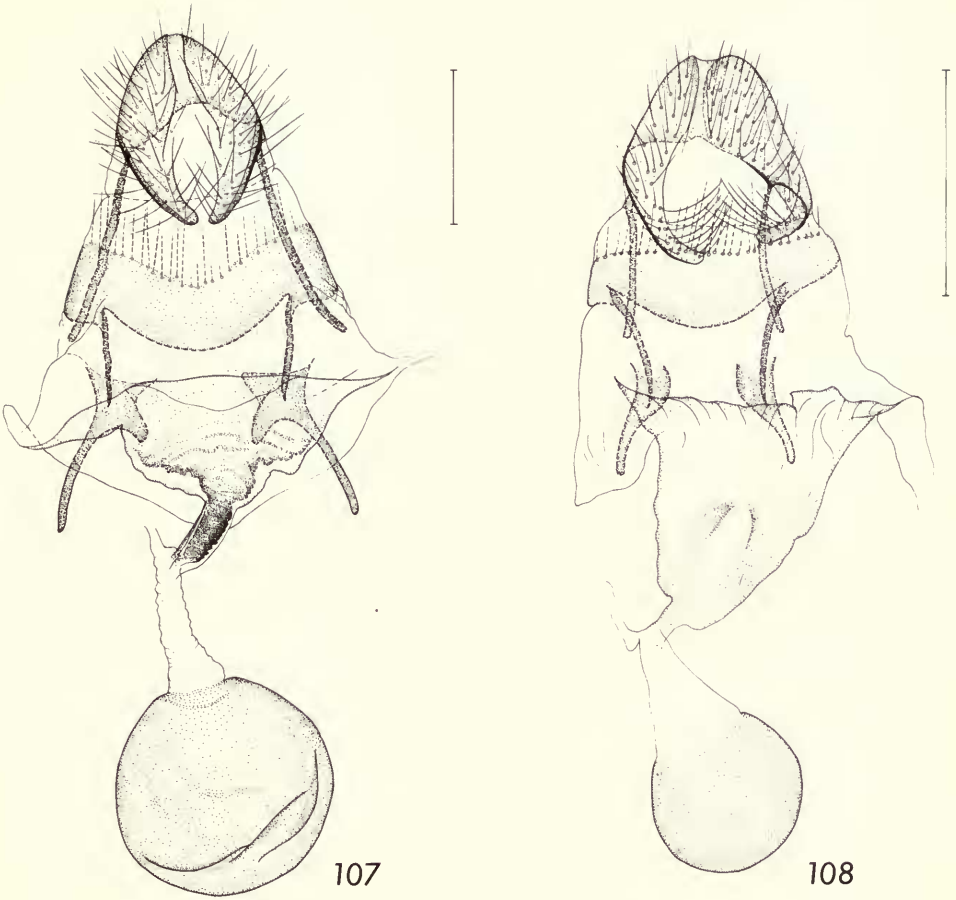




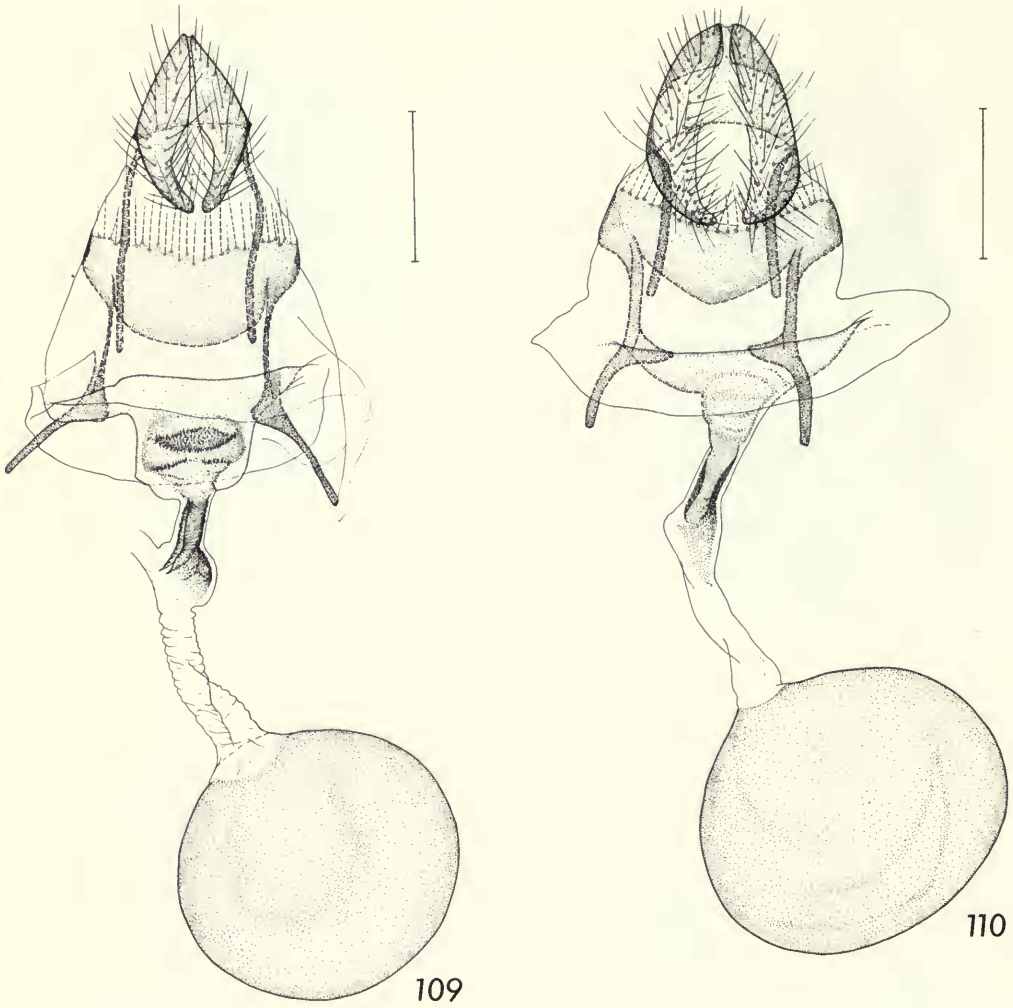
Figs 103, 104 Female genitalia. 103, *Scirpophaga imparella* (Meyrick). 104, *S. xantharrenes* Common.



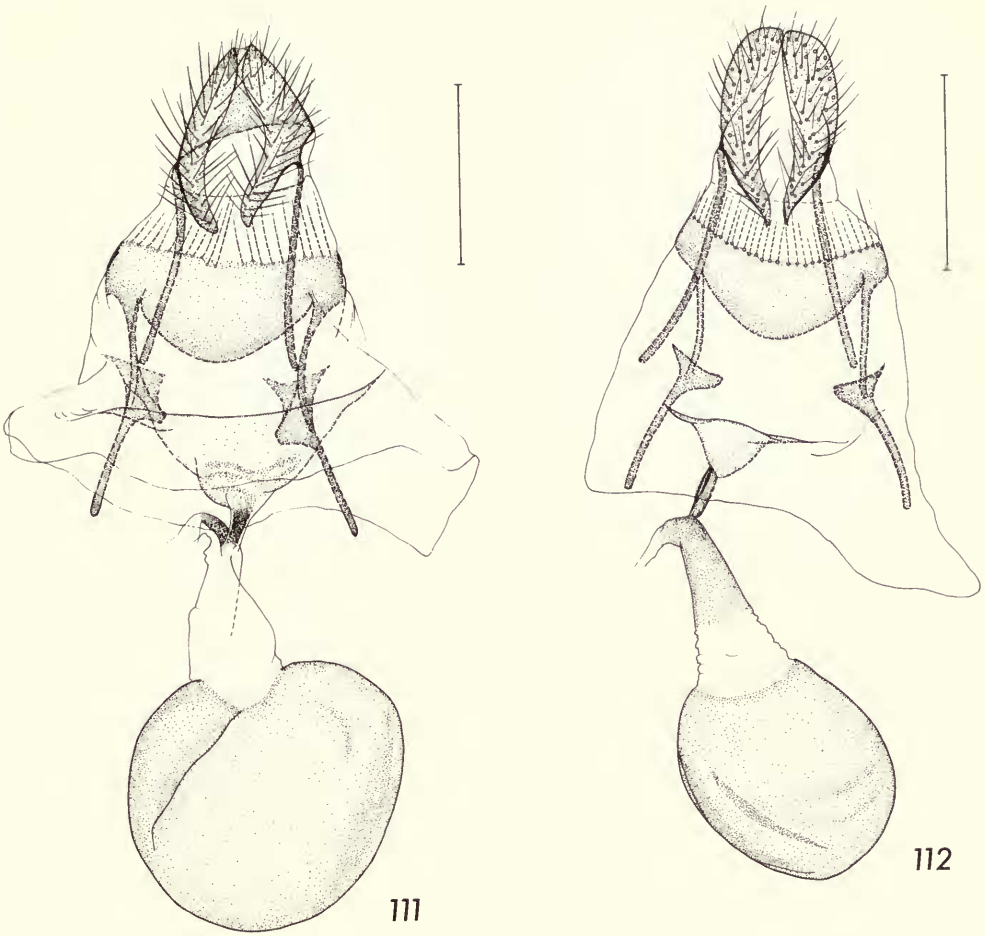
Figs 105, 106 Female genitalia. 105, *Scirpophaga excerptalis* (Walker). 106, *S. magnella* de Joannis.



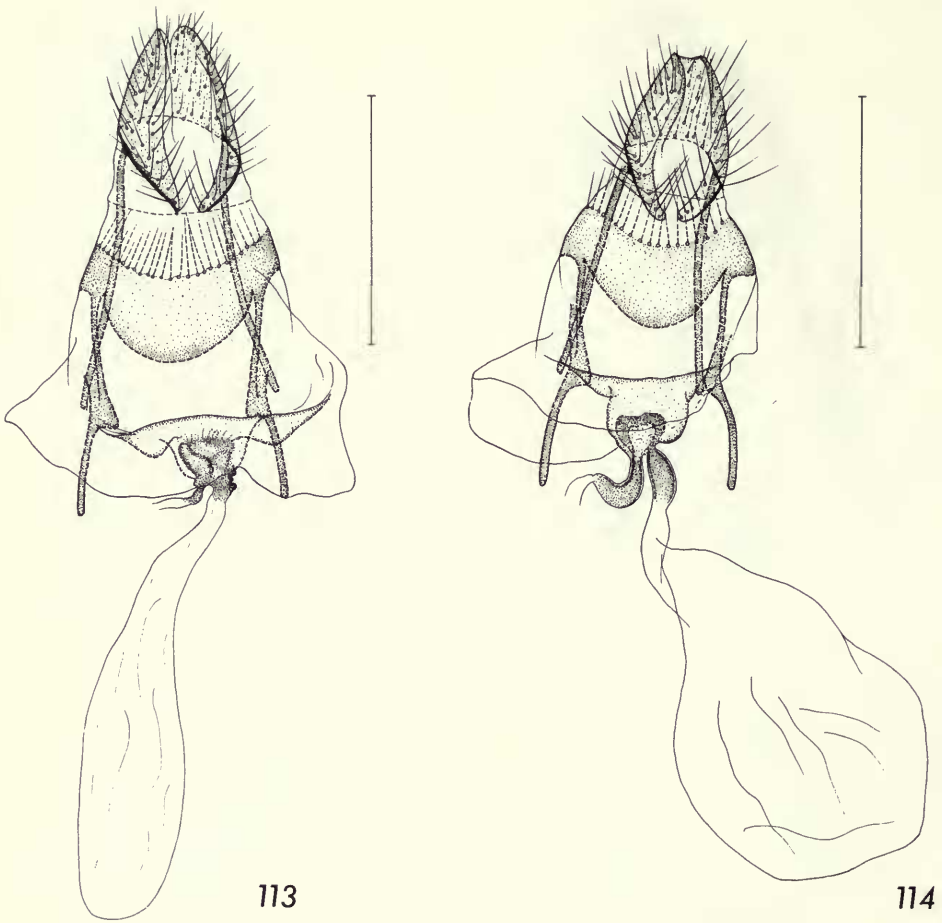
Figs 107, 108 Female genitalia. 107, *Scirpophaga tongyaii* sp. n. 108, *S. melanostigma* (Turner).



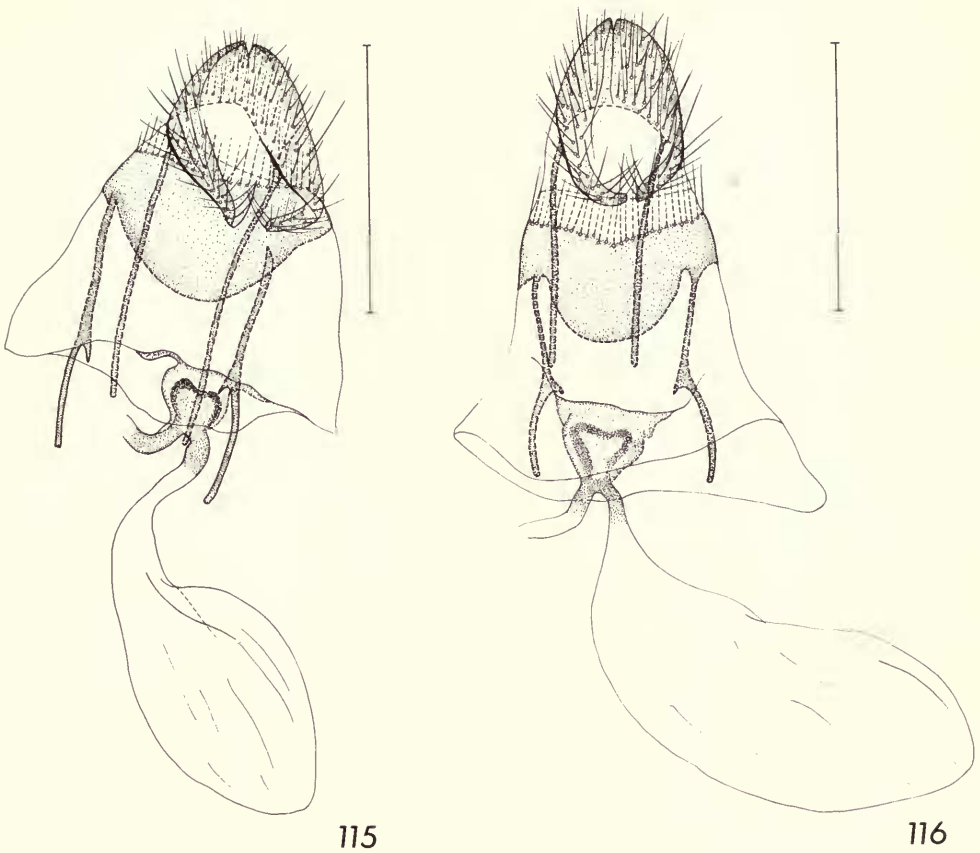
Figs 109, 110 Female genitalia. 109, *Scirpophaga ochritinctalis* (Hampson). 110, *S. bradleyi* sp. n.



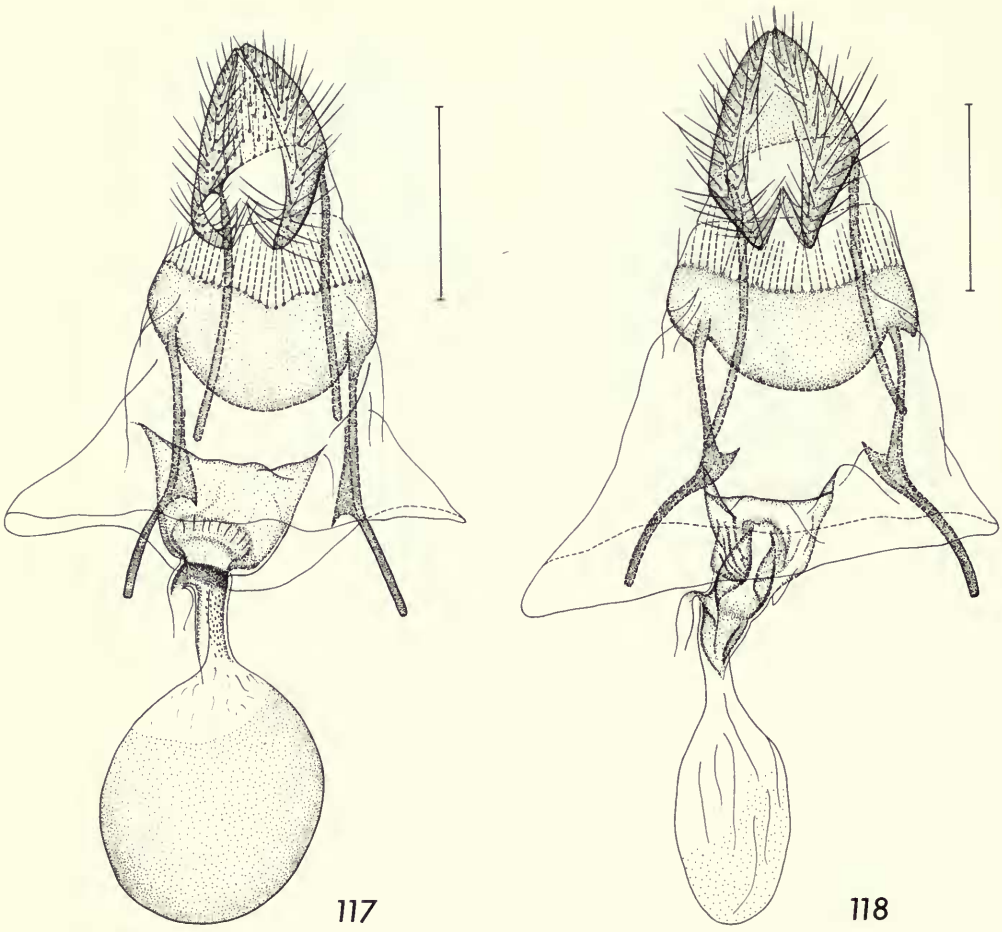
Figs 111, 112 Female genitalia. 111, *Scirpophaga xanthogastrella* (Walker). 112, *S. gotoi* sp. n.



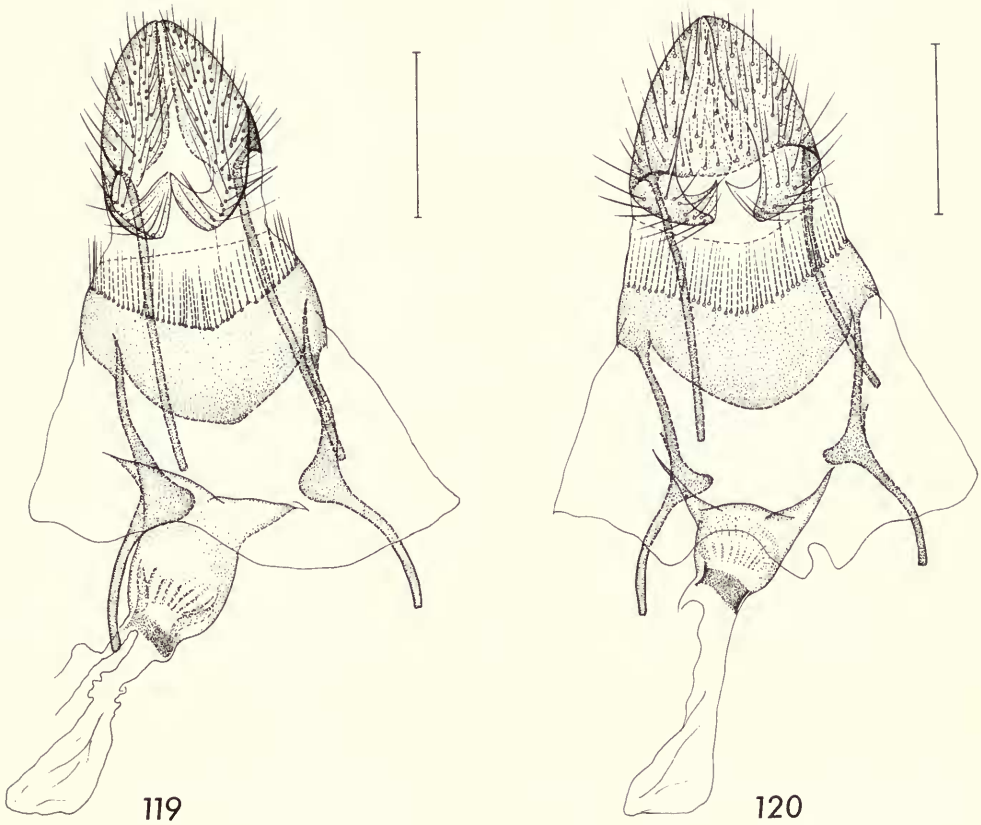
Figs 113, 114 Female genitalia. 113, *Scirpophaga occidentella* (Walker). 114, *S. fusciflua* Hampson.



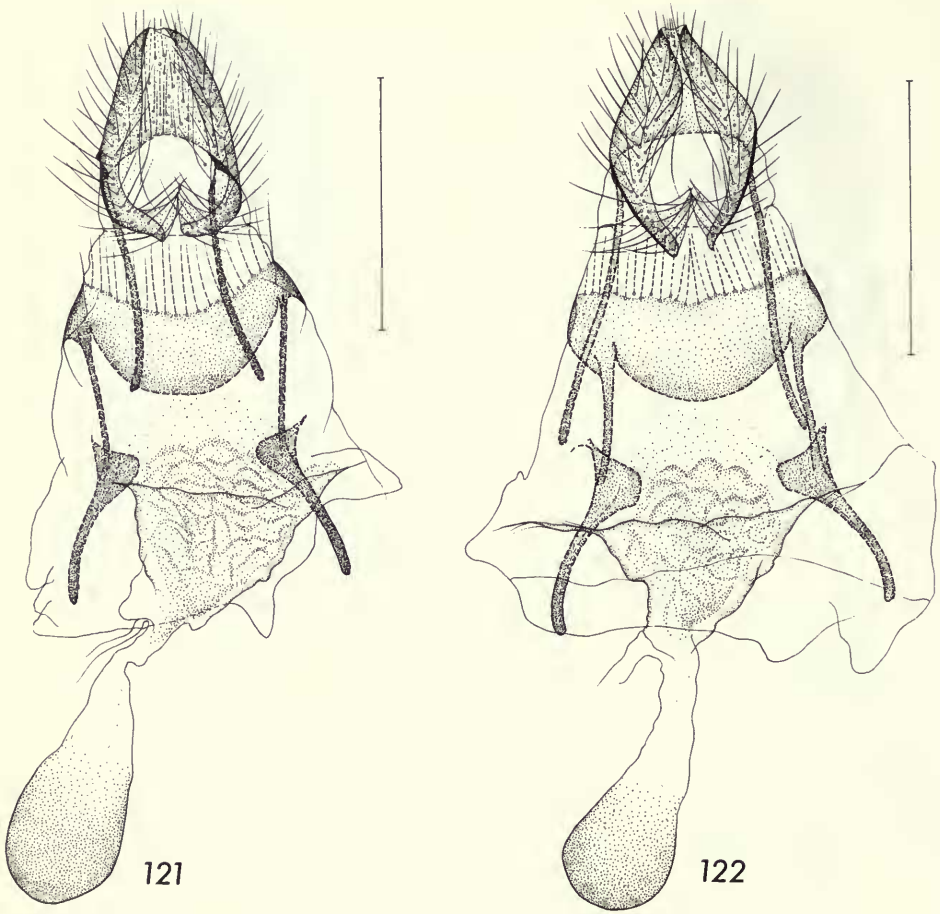
Figs 115, 116 Female genitalia. 115, *Scirpophaga ochroleuca* Meyrick. 116, *S. virginia* Schultze.



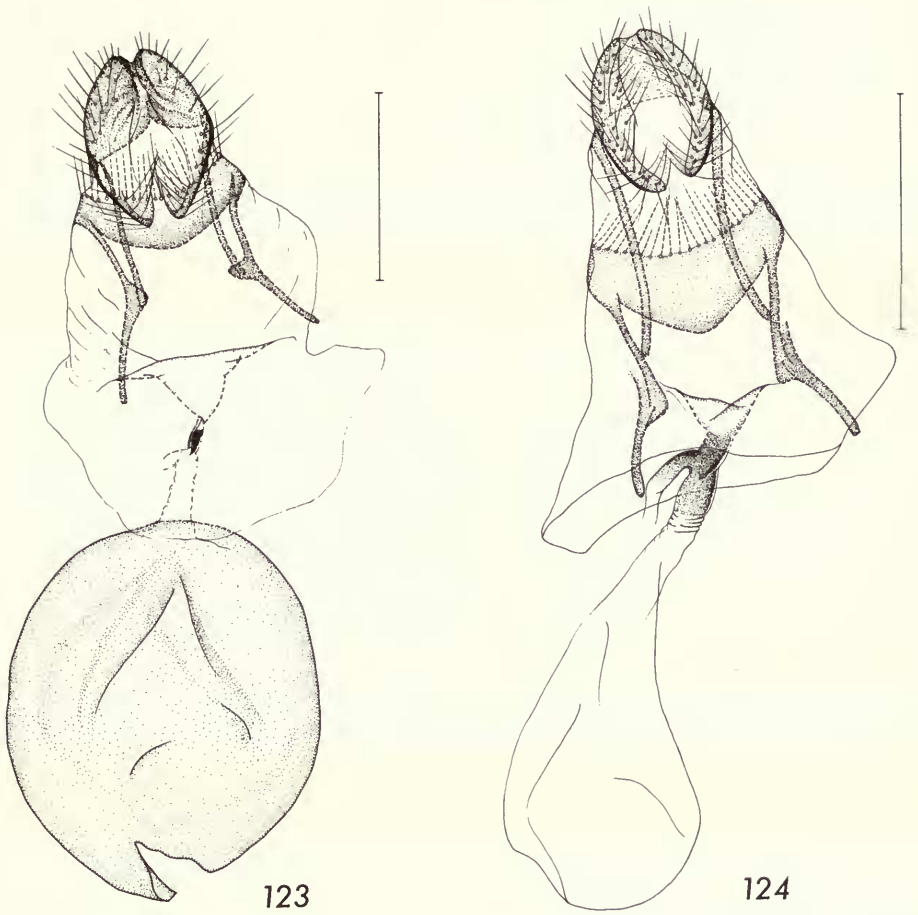
Figs 117, 118 Female genitalia. 117, *Scirpophaga subumbrosa* Meyrick. 118, *S. marginepunctella* (de Joannis).



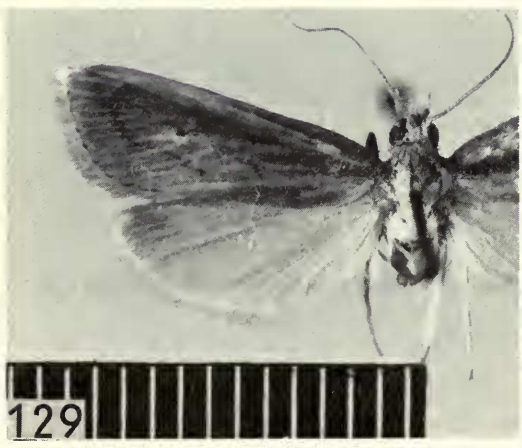
Figs 119, 120 Female genitalia. 119, *Scirpophaga serena* (Meyrick). 120, *S. goliath* Marion & Viette.



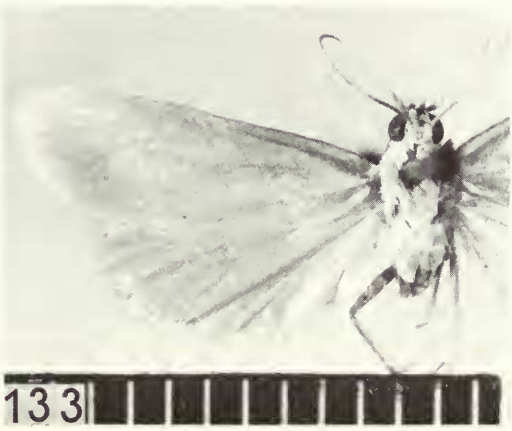
Figs 121, 122 Female genitalia. 121, *Scirpophaga incertulas* (Walker). 122, *S. innotata* (Walker).



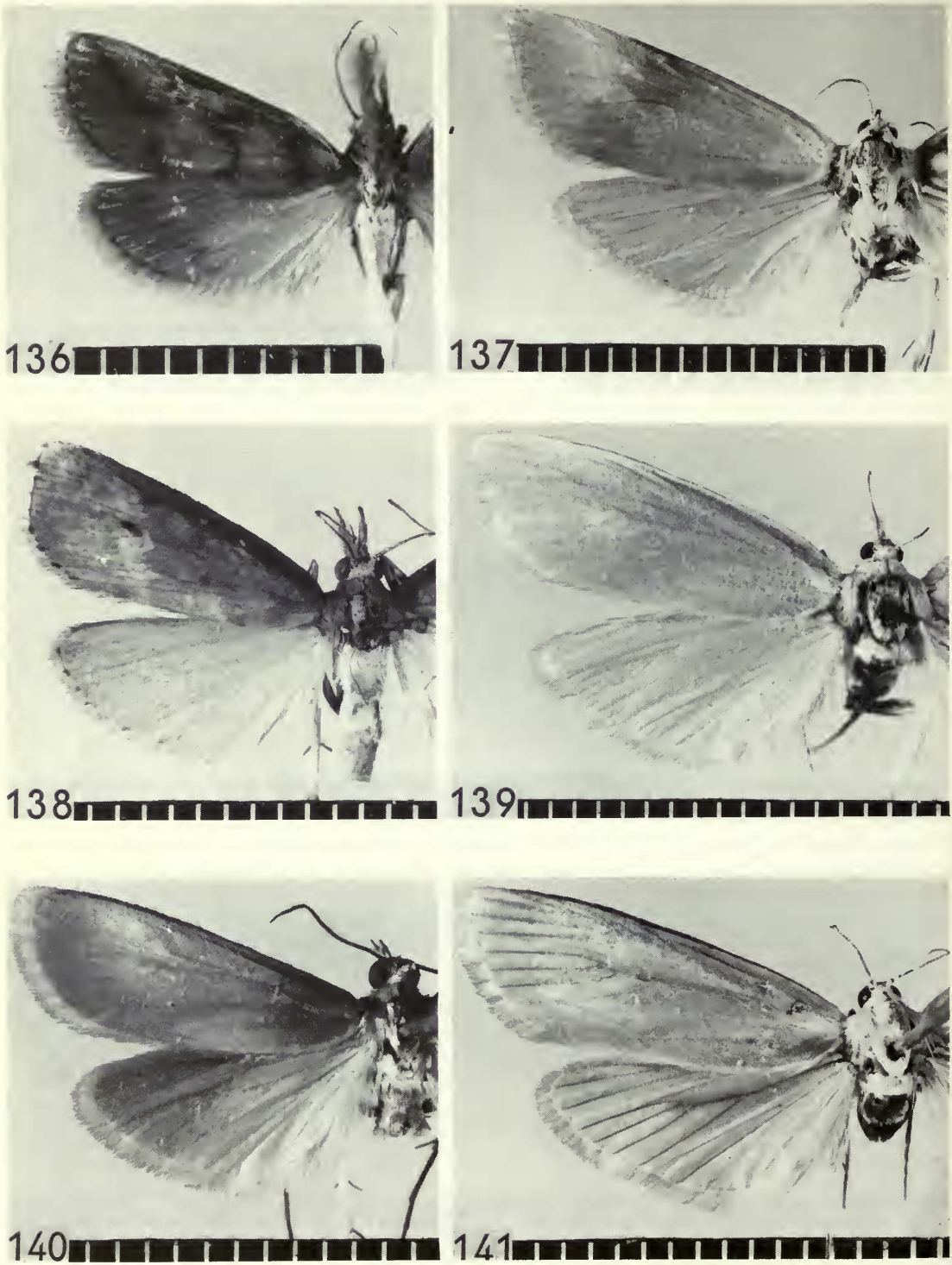
Figs 123, 124 Female genitalia. 123, *Scirpophaga lineata* (Butler). 124, *S. whalleyi* sp. n.



Figs 125–130 *Scirpophaga* species. 125, *S. praelata* (Scopoli), ♂; 126, *S. praelata* (Scopoli), ♀; 127, *S. xanthopygata* Schawerda, ♂; 128, *S. xanthopygata* Schawerda, ♀; 129, *S. nivella* (Fabricius), ♂; 130, *S. nivella* (Fabricius), ♀.

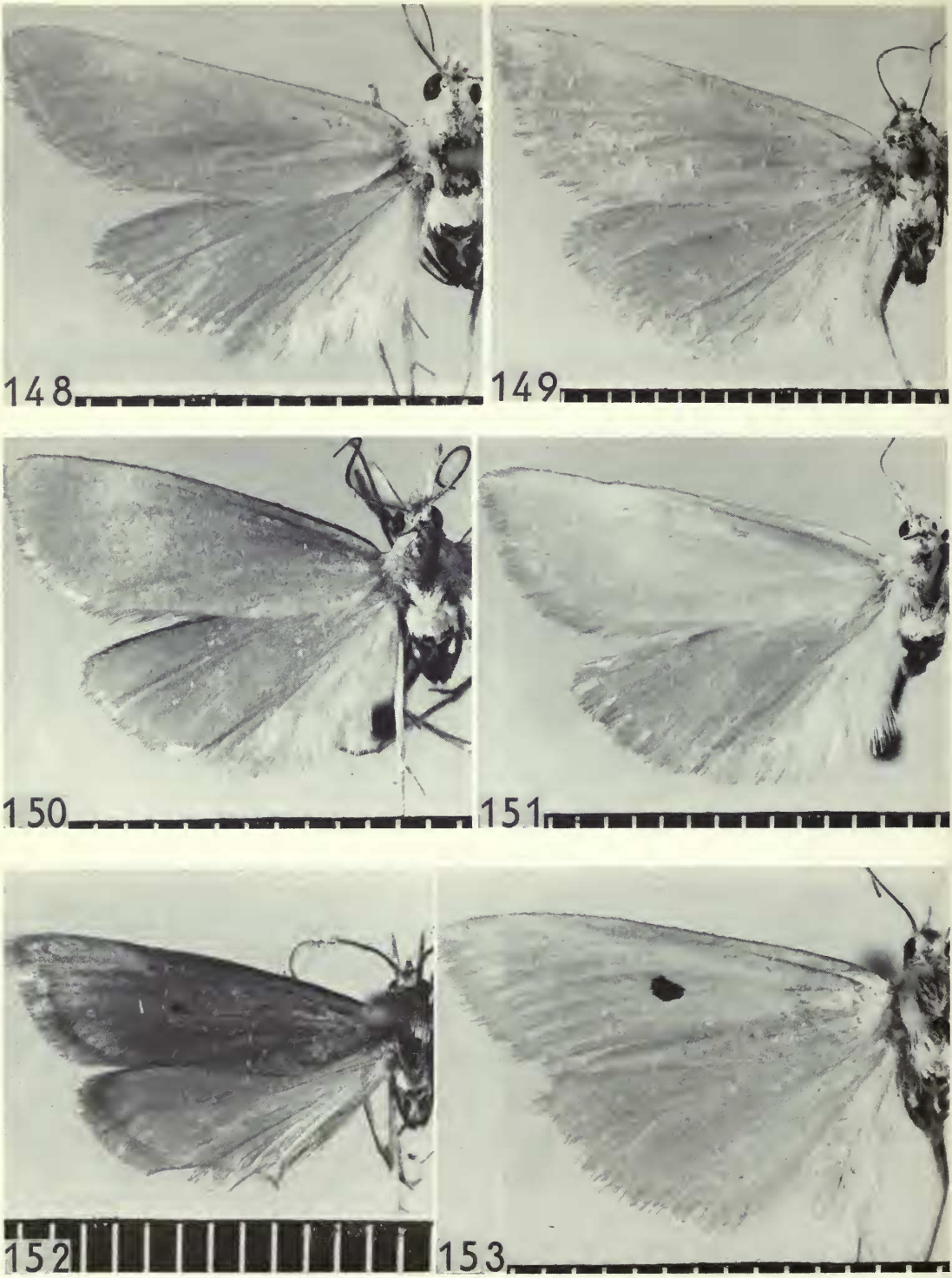


Figs 131–135 *Scirpophaga* species. 131, *S. parvalis* (Wileman), ♂; 132, *S. parvalis* (Wileman), ♀; 133, *S. phaedima* Common, ♂; 134, *S. gilviberbis* Zeller, ♂; 135, *S. gilviberbis* Zeller, ♀.

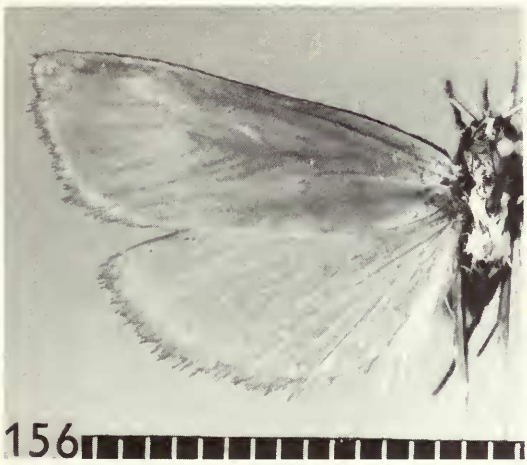


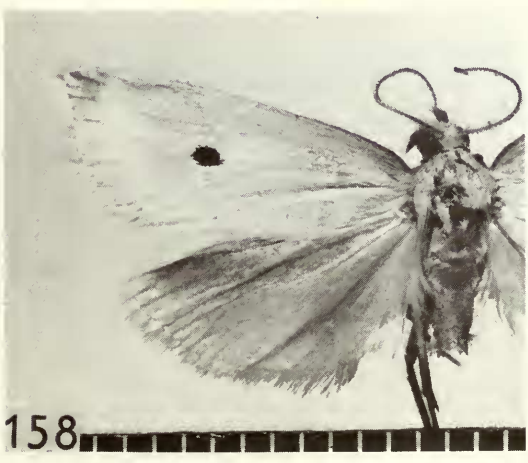
Figs 136–141 *Scirpophaga* species. 136, *S. percna* Common, ♂; 137, *S. percna* Common, ♀; 138, *S. imparella* (Meyrick), ♂; 139, *S. imparella* (Meyrick), ♀; 140, *S. xantharrenes* Common, ♂; 141, *S. xantharrenes* Common, ♀.

Figs 142–147 *Scirpophaga* species. 142, *S. melanoclista* Meyrick, ♂; 143, *S. melanoclista* Meyrick, ♀; 144, *S. excerptalis* (Walker), ♂; 145, *S. excerptalis* (Walker), ♀; 146, *S. excerptalis* (Walker), ♂; 147, *S. magnella* de Joannis, ♀.

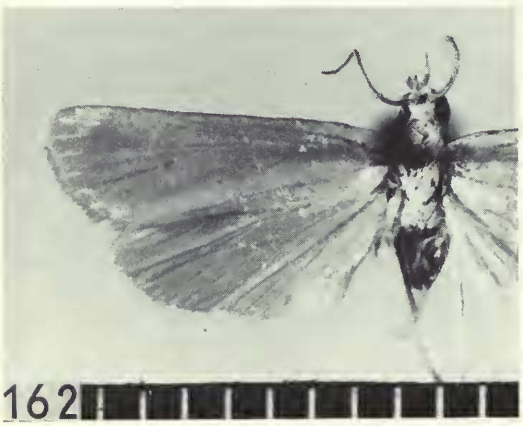


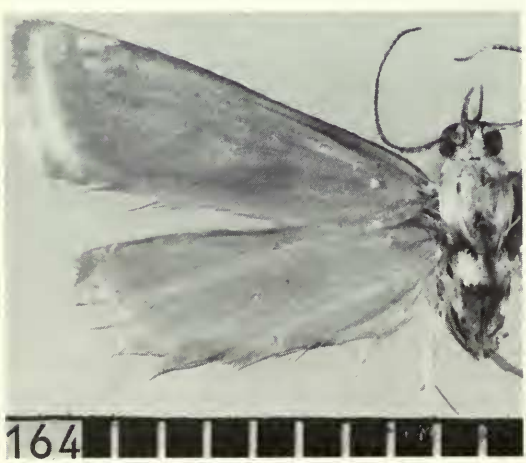
Figs 148–153 *Scirpophaga* species. 148, *S. magnella* de Joannis, ♂; 149, *S. magnella* de Joannis, ♀; 150, *S. xanthogastrella* (Walker), ♂; 151, *S. xanthogastrella* (Walker), ♀; 152, *S. brunnealis* (Hampson), ♂; 153, *S. khasis* sp. n., ♂.



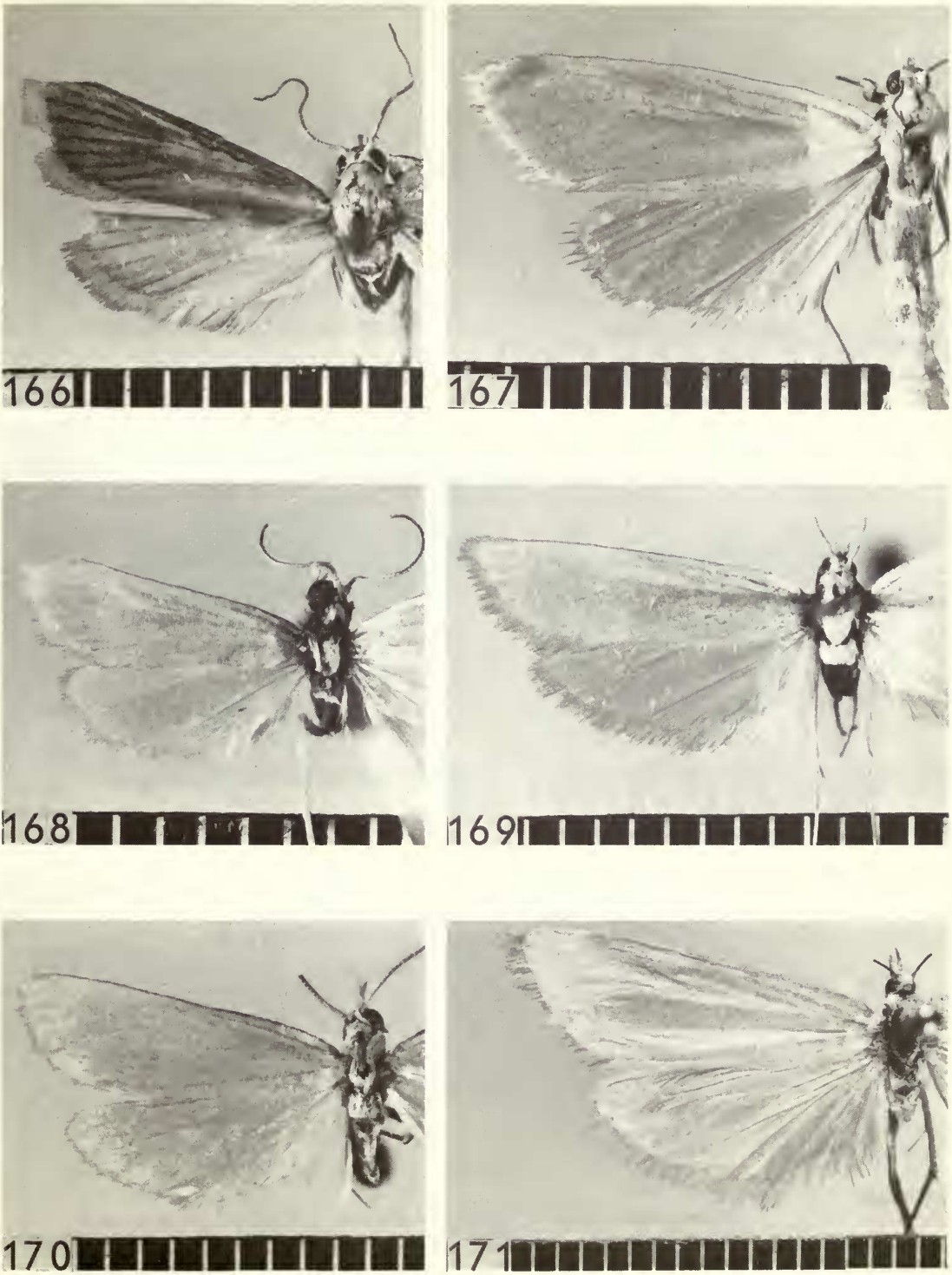


Figs 154–159 *Scirpophaga* species. 154, *S. ochritinctalis* (Hampson), ♂; 155, *S. ochritinctalis* (Hampson), ♀; 156, *S. bradleyi* sp. n., ♂; 157, *S. bradleyi* sp. n., ♀; 158, *S. flavidorsalis* (Hampson), ♂; 159, *S. melanostigma* (Turner), ♀.

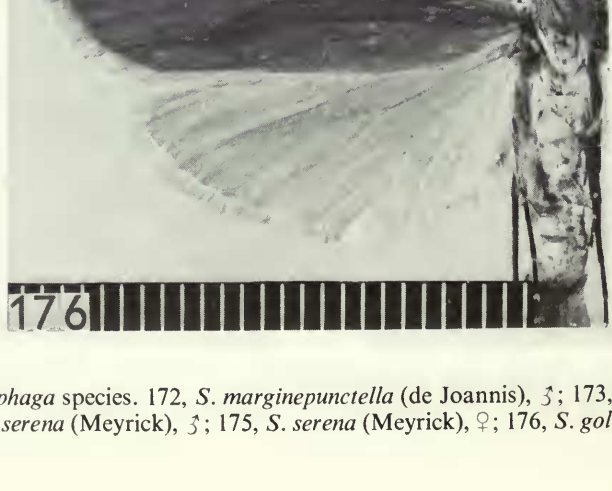




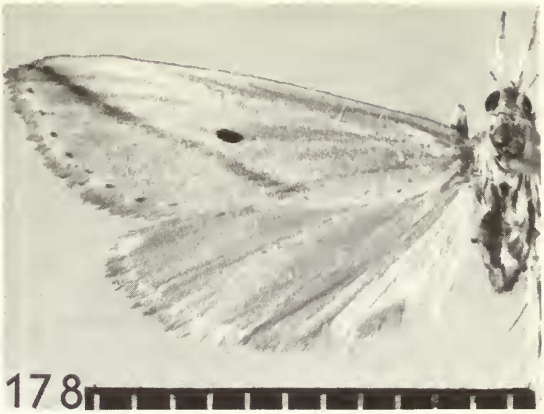
Figs 160–165 *Scirpophaga* species. 160, *S. tongyaii* sp. n., ♂; 161, *S. tongyaii* sp. n., ♀; 162, *S. occidentella* (Walker), ♂; 163, *S. occidentella* (Walker), ♀; 164, *S. fusciflua* Hampson, ♂; 165, *S. fusciflua* Hampson, ♀.

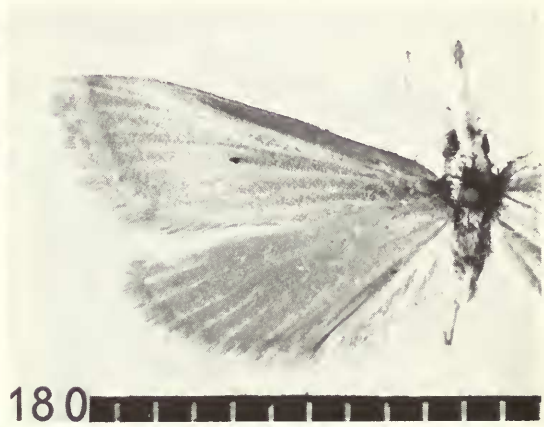


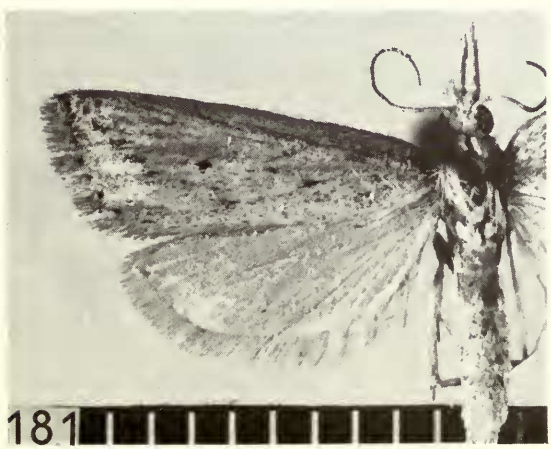
Figs 166–171 *Scirpophaga* species. 166, *S. ochroleuca* Meyrick, ♂; 167, *S. ochroleuca* Meyrick, ♀; 168, *S. virginia* Schultze, ♂; 169, *S. virginia* Schultze, ♀; 170, *S. subumbrosa* Meyrick, ♂; 171, *S. subumbrosa* Meyrick, ♀.

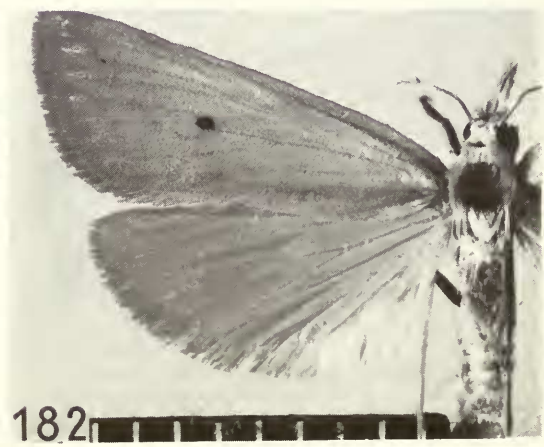


Figs 172–176 *Scirpophaga* species. 172, *S. marginepunctella* (de Joannis), ♂; 173, *S. marginepunctella* (de Joannis), ♀; 174, *S. serena* (Meyrick), ♂; 175, *S. serena* (Meyrick), ♀; 176, *S. goliath* Marion & Viette, ♀.

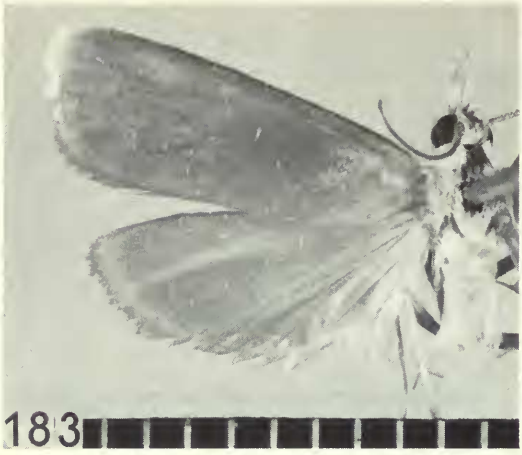


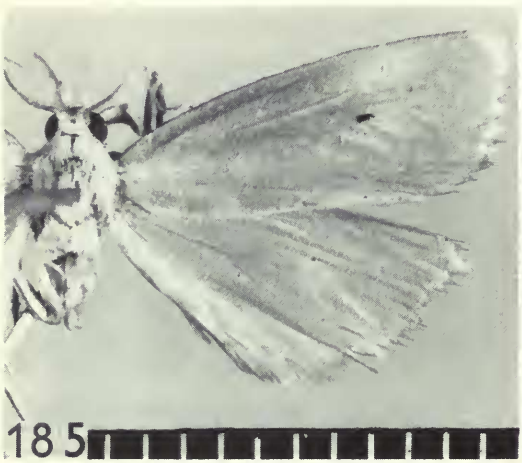






Figs 177–182 *Scirpophaga* species. 177, *S. lineata* (Butler), ♂; 178, *S. lineata* (Butler), ♀; 179, *S. aurivena* (Hampson), ♂; 180, *S. auristrigella* (Hampson), ♂; 181, *S. incertulas* (Walker), ♂; 182, *S. incertulas* (Walker), ♀.





Figs 183–188 *Scirpophaga* species. 183, *S. innotata* (Walker), ♂; 184, *S. innotata* (Walker), ♀; 185, *S. gotoi* sp. n., ♂; 186, *S. gotoi* sp. n., ♀; 187, *S. whalleyi* sp. n., ♂; 188, *S. whalleyi* sp. n., ♀.

Index

Invalid names are in *italics;* principal references are in **bold.**

Acentria 188
Adelpherupa 189
admotella 190, **243**
alba 190, **205,** 206
albinella 190
Apurima 187, **190,** 196
Argyractini 188
Argyrostola 189
auriflua 190, **211**
auristrigella 193, 240, 241, **242**
aurivena 193, 240, 241, **242**

bipunctifera 190, **243**
bradleyi 192, 202, 222, 223, **229,** 230, 232
brunnealis 192, 217, 222, **228**
brunnescens 191, **211,** 212
butyrota 211, 214, **223,** 224, 226

Calamoschoena 188
cargaritifera 188
Catagela 189, 191, 196
celidias **211,** 214
Chilo 190
chionotus 217
chrysorrhoa 190, 191, **211,** 212
cinerea 190, **205,** 206
costalis 227
Crambinae 189–191
Crambostenia 189

Donacaula 189, 190, 196
dubia 190, **205**

elachia 217
Erupa 189
euclastalis 211
excerptalis 185, 190–192, 194, 198, 201, 209, 212, 213, 222, **223,** 224–228, 230
excerptalis-group 185, 193, 201–203, 209, **222**

flavidorsalis 192, 194, 222, **230,** 231
flavus 189
fusciflua 192, 233, **234,** 235–237

Gabalaeca 189
gilviberbis 190, 192, 194, 195, 203, 204, **216,** 217, 218, 234
gilviberbis-section 203, 204
goliath 193, 233, 234, **239,** 240
gotoi 193, 203, **249**
gotoi-group 185, 203, **249**
gratiosellus **243,** 244, 246
grisea 205, 206

hoplites 217
helodes 191, **219,** 220
Helonastes 187, 189, 191, 196

incertulas 190–195, 212, 218, **243,** 244, 247, 249, 251
incertulas-group 185, 201, 203, **242**
innotata 190–196, 243, 244, **246,** 247
intacta 223
intactella 189
imparella 191, 192, 195, 203, 204, 218, **219,** 220

khasis 192, 222, **230**

Lancia 189
latidactyla 190, **205**
Leechia 188, 189
leucatea 190
lineata 193, 194, **240,** 241, 242
lineata-group 185, 201, 203, **240**
limnochares 191, **205,** 206, 209

macrostoma 229
magnella 192, 222–224, **226,** 228, 230
marginepunctella 192, 233, 237, **238,** 239
melanoclista 192, 203, 204, **221**
melanostigma 192, 194, 222, 223, 226, **231,** 232
melitopsis 189
minutellus 190, **243,** 244, 246
monostigma 190, **223,** 224, 228

Neerupa 189
Neoschoenobia 188, 189
nigropunctata 189
Niphadoses 187, 191, 196, 217
Niphopyralis 188, 189
nivella 191, 192, 194, 195, 203, 204, 209, **211,** 213, 216, 218, 222–224, 227, 238, 244
niveus 211
Nymphulinae 188

occidentella 190, 192, 233, **234**
occidentella-group 185, 193, 201, 203, **233,** 237, 239, 249
ochritinctalis 192, 222, 223, **229,** 230, 232
ochroleuca 191, 192, 194, 233, 234, **235**

palleucus 217
pallidalis 188
parvalis 192, 193, 203, 204, **214,** 215
Patissa 189
percna 191, 192, 194, 195, 203, 204, **218,** 221
percnopsis 189
phaedima 191, 192, 195, 203, 204, **215,** 216
phantasmatalis 205
phantasmatella 189, 190, 195, **205,** 206
phantasmella 189, 190, 195, **205,** 206
praelata 185, 190–204, **205,** 206, 209, 211
praelata-group 185, 193, 201, **203,** 204, 218, 221, 240, 249

praelata-section **203,** 204, 217
Promacrochilo 189
punctellus 190, **243**
pyraustalis 188
Pyraustinae 188

quadripunctellifera 243

Ramila 188, 189
rhodoproctalis 223
Rupela 188, 190, 191, 193

Schoenerupa 189
Schoenobiinae 185, **188,** 189–191, 196, 201
Schoenobius 187, 189–191, 196
Scirpophaga 185–187, 189–194, **195,** 196, 201, 202, 206, 243
serena 192, 233, 234, 238, **239**
sericea Passerini 190
sericea Snellen 247
Siga 191
Siginae 191
subumbrosa 192, 233, **237,** 238

Tephroniopsis 189
Thopeutis 190
Tipanaea 188, 190, 191
tongyaii 192, 222, 223, **232**
Topeutis 187, 190, 191
Tryporyza 191, **196,** 243

virginea 189, 190
virginia 185, 192, 233–235, **236,** 237

whalleyi 193, 194, 202, 203, **251**
whalleyi-group 185, 202, 203, **250**

xantharrenes 191, 192, 195, 203, 204, 218, **221**
xanthogastrella 190, 192, 194, 196, 222, 223, **227,** 228
xanthoperas 189
xanthopygata 185, 192–194, 203, 204, 206, **209,** 211, 215

Zolea 189